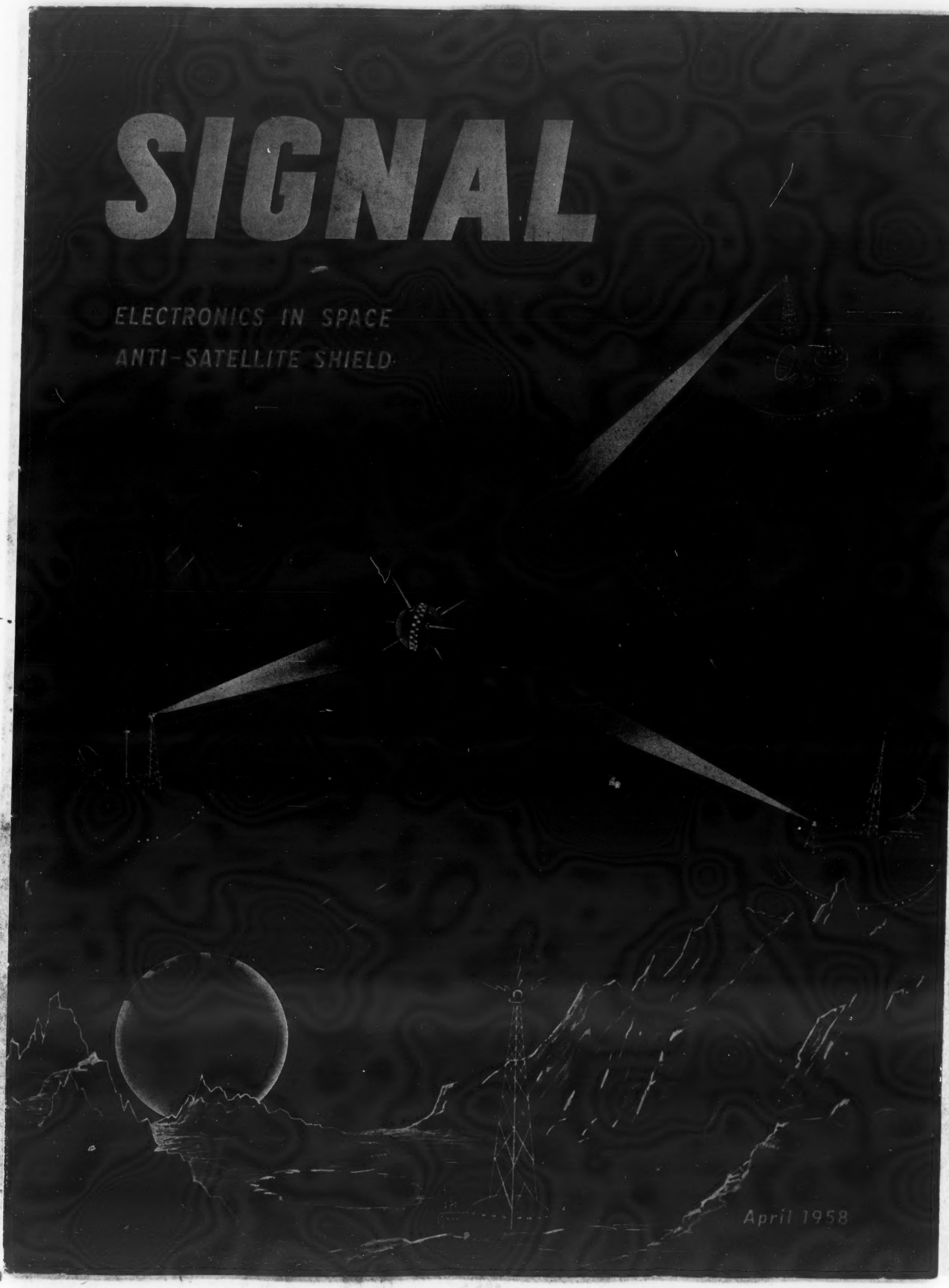
SIGNAL

ELECTRONICS IN SPACE

ANTI-SATELLITE SHIELD



April 1958

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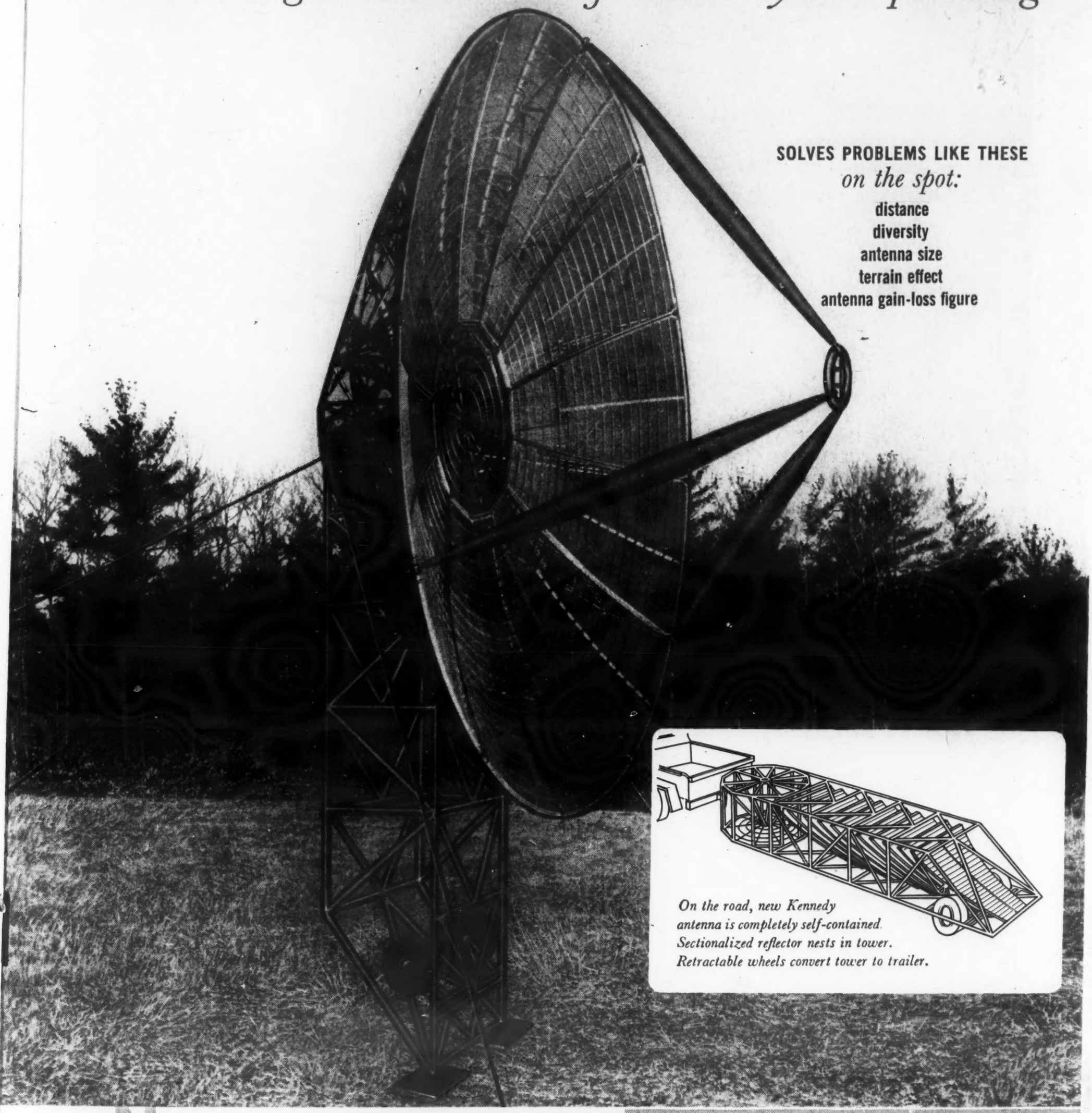

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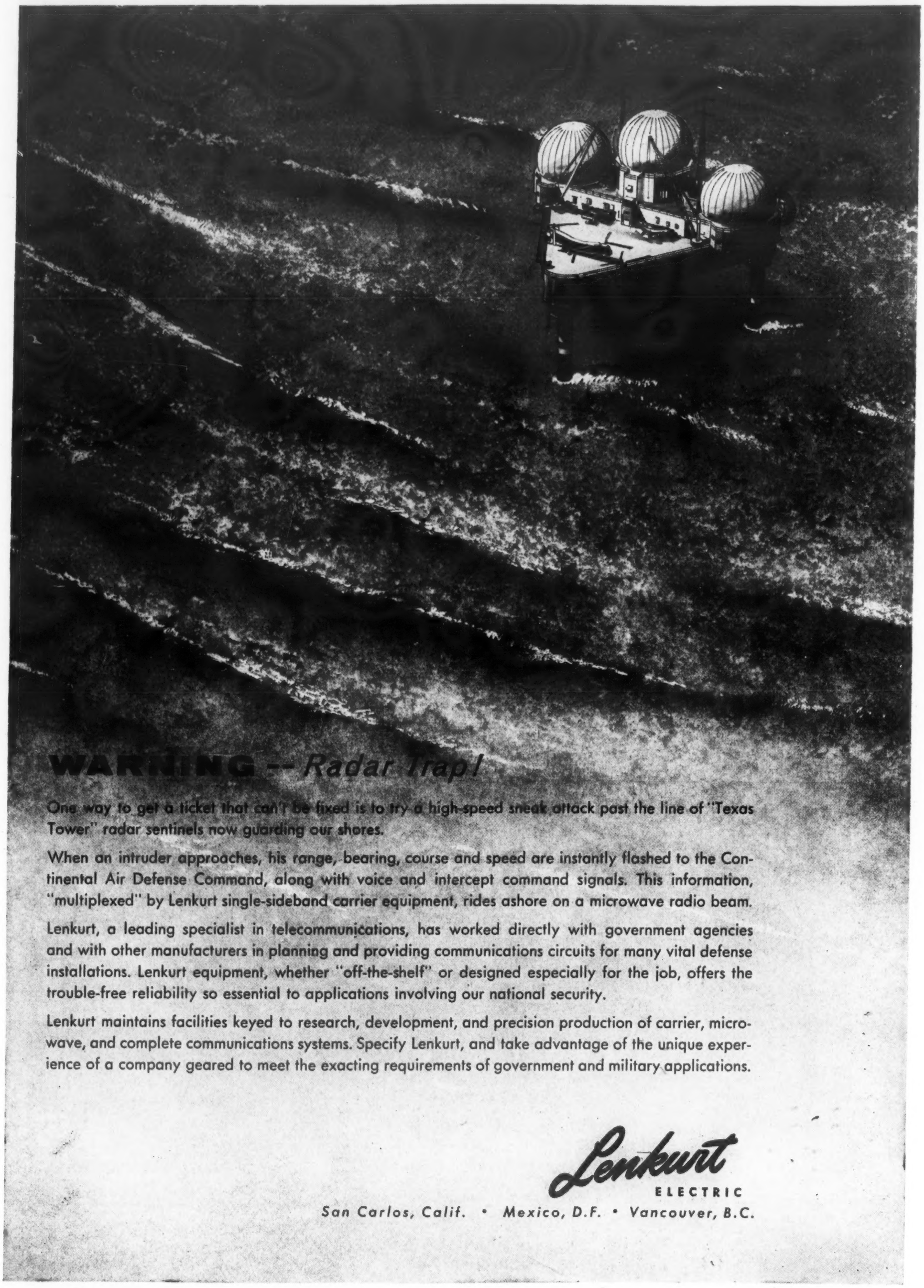

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Cover

SIGNAL's cover represents the Editor's idea of imagination at work in outer space. Portrayed is a U. S. electronic station on the moon in communication with three patrol space craft operated from the planet earth. Man and auxiliary equipment, having been released, stand by to report on the electronic fix of an unidentified satellite, captured in the act of photographing earth. Surpassing the anti-missile missile will be tomorrow's anti-satellite shield.

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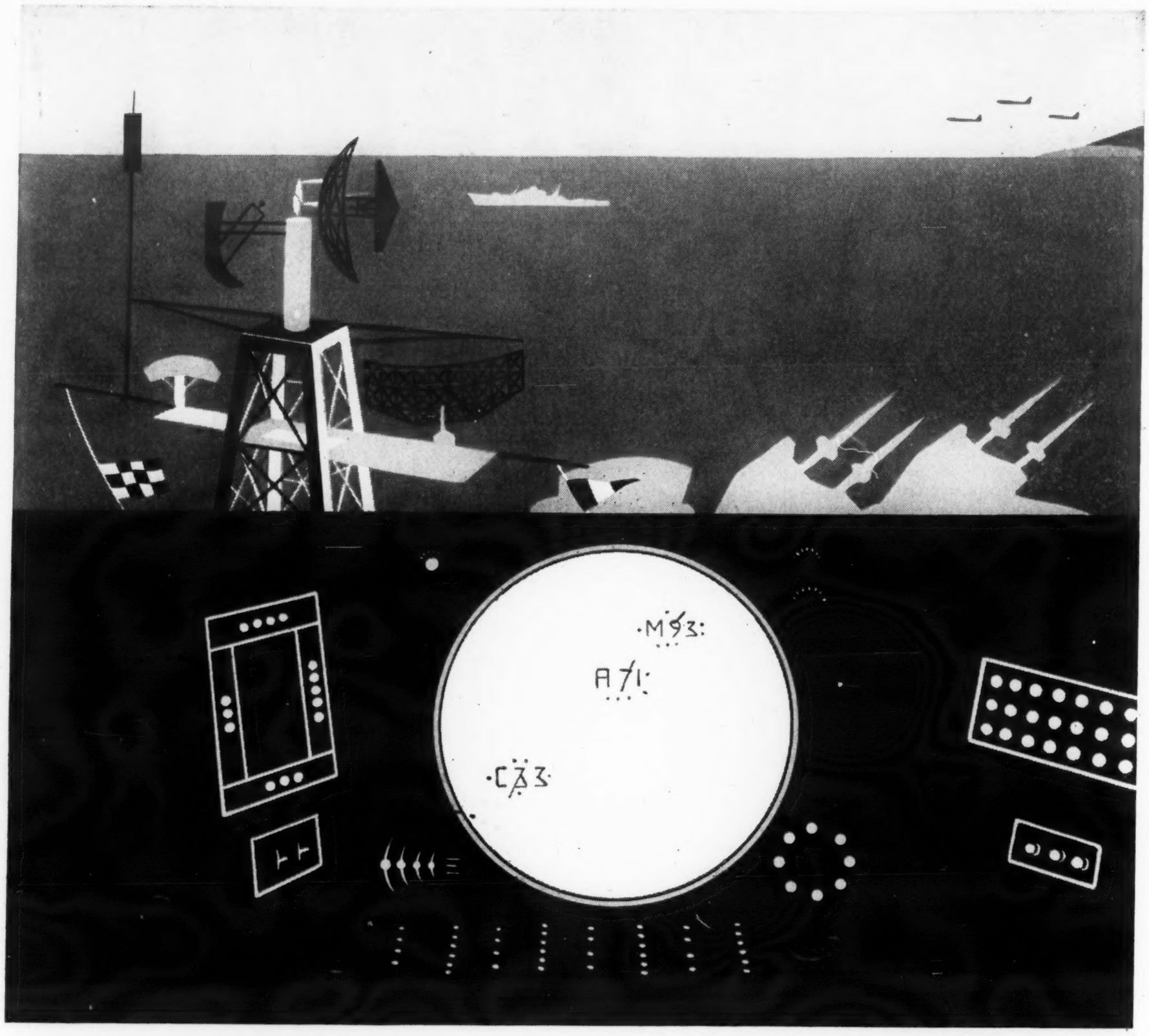

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by General Maxwell D. Taylor, USA

STRATEGY

of sword and shield

STRATEGY HAS LONG BEEN HISTORICALLY RELATED TO THE conduct of war and only rarely associated with the conduct of peace. However, in this period of world tension, we in uniform take as our objective, first and foremost, a strategy of deterrence—a strategy for the prevention of war.

It requires no eloquence on my part, I am sure, to convince you of the necessity of creating conditions which will make general atomic war impossible, or at least highly improbable. It is an inescapable fact that a megaton nuclear conflict would bring irreparable disaster to all participants. In such a war no true victor could emerge. Hence, our strategy and efforts are directed toward the prevention of this disaster; it must never be allowed to occur.

Because of the suicidal nature of general nuclear war, it appears increasingly unlikely that any nation will deliberately embark on such a war. However, that conclusion does not necessarily mean that international Communism will renounce armed aggression as a tool of policy. There is strong reason to feel that while avoiding general atomic war, Communism will incline toward limited aggression, infiltration, subversion and the like—courses of action which appear as increasingly serious threats to world peace. These forms of aggression, if not arrested, may lead to the erosion of the Free World and to our loss, piecemeal, of that which we are pledged to defend. If resisted, they must be resisted promptly and successfully, for otherwise the contagion would spread. Consequently, immediately after the deterrence of general war, I consider the mission of deterring, or winning quickly any local aggression an indispensable part of our security.

Thus, in my judgment, the effectiveness of our national strategy and our Armed Forces must be judged by the contribution, actual or potential, to the deterrence of war. This very practical consideration bears upon the conduct of our daily military business in the Pentagon. Within the Army, for example, everything which we do is examined in terms of its contribution to deterrence. As we make up the annual Army budget, the Staff is required to establish the relation of the combat forces supported by the budget to their contribution to deterrence. For instance, in the FY 59 budget, 66 per cent of our dollars and 68 per cent of our personnel are used to maintain Army forces with an identifiable contribution to our national deterrent power.

Thus far, in developing our deterrent strength our principal reliance has been placed upon the atomic retaliatory power represented by the long-range bombers of the Air Force and of the Navy. However, in the last year we have received evidence which indicates that the Soviet bloc has made great strides in the same general area. Not only has the Soviet Air Force increased in its capabilities, but we now recognize the extent of Soviet progress in the long-range missile field. These facts lead us to conclude that we have entered, or soon will enter, a period in which both power blocs have sufficient means to destroy one another in a war in which long-range bombers and missiles could deliver without restriction many megatons of destruction upon opposing targets. This condition is that state of mutual deterrence which we have anticipated in past discussions and which now seems to be upon us. It is on some of the implications of this new situation which I would like to dwell for a few moments.

In a period in which the two great world power blocs stand with atomic weapons levelled at one another, it is safe to anticipate that neither side will deliberately do anything which would have a strong probability of provoking the other to pull the trigger. Under such conditions there is likely to be a rise in the level of provocation which a great nation will accept before seeking the ultimate recourse of unrestricted atomic warfare. In the past, wars have often been precipitated for relatively minor immediate causes. The Sino-Japanese War had its origin in the demolition of a section of the South Manchurian Railway in 1931. Poland and Russia went to war in 1919 over a boundary dispute dating from 1772. World War I was precipitated by the assassination of an Austro-Hungarian Prince. In 1731, Spanish mariners in the course of boarding the English brig, the *Rebecca*, cut off the ear of the British Captain Jenkins. To avenge this indignity inflicted upon a subject, England embarked upon the series of hostilities known as the War of Jenkins' Ear.

We are entering an era where nations are likely to require much greater provocation than a section of railroad track, an old boundary dispute, a political assassination, or even a subject's ear to warrant recourse to general war. This is an important point, I believe, because it is a reminder of the need for Armed Forces which can cope with provocative situations without the need to resort to means likely to bring on general war. They must be capable of applying measured force adjusted to the provocation and offering many alternatives beyond the direful choice of general war.

This situation is not new to the Soviets. For years they were forced to operate in the face of our monopoly of atomic weapons. One must admit that our advantage did not seem to impair Soviet activity. Since World War II they have shown great versatility and adaptability in applying techniques of political and military aggression without releasing general war. They have advanced their boundaries in eleven countries by an adroit combination of infiltration, subversion, coup d'état, and direct military action. They have been willing to run risks at a time when the advantages of com-

General Taylor
Chief of Staff
United States Army

plete atomic monopoly were on our side. Since 1945 Soviet Russia has helped create and arm some ten national armies in allied countries—three in Asia and seven in Europe, and with these forces the Soviets and their allies have engaged in eight small wars. All this has been done without regard to the possible consequences of our superiority in nuclear weapons.

Of late, relying on the impression created by their successes in the missile and satellite fields, they have shown a clear intention to push forward more aggressively and exploit the presumed higher level of acceptable provocation in the West. During the past year and a half the USSR has become more violent in its propaganda attacks on states friendly to us. Guided by a policy designed to frighten free nations and split them off from their alliances, Moscow leaders have hurled a succession of threats and blandishments at our allies. In November 1956, the USSR threatened the use of military force in the form of "volunteers" in demanding that Britain and France stop the Suez conflict. In the months that followed, Krushchev attacked the Eisenhower doctrine and sent letters to Norway and Denmark containing warnings on U. S. bases. These actions were followed by similar menaces to the Netherlands, Great Britain, and West Germany, warning of devastating retaliation if nuclear attacks were made on Russia from their territories. At one time, Krushchev stated that his country possessed an H-bomb so big that Russians dared not test it in the USSR—that if it were set off at the North Pole, it would melt the ice cap and send oceans spilling over the world. Last October, the Sputnik satellite soared into space, and Soviet foreign policy assumed an even more truculent tone. Turkey was bluntly accused of being a threat to Syria, and the U. S. was charged with inciting war between Turkey and Syria.

These facts suggest that with the present growth in Soviet military capabilities there is likely to be a further increase in Soviet aggressiveness in international relations. In such an atmosphere we will be called upon to manifest a cool steadfastness in the face of the missile blackmail and tough diplomacy which we can expect to encounter in our future relations with the Communist bloc.

This steadfastness which I invoke must be based upon justified self-confidence which is the outgrowth of strength in being. Again, I would stress that the strength in being is not solely military. Indeed, it is of equal if not greater importance that it be built upon political, economic and moral bases as firm in their respective spheres as is the foundation of our military strength. But I promised to deal only with the military aspects of the matter, so it is at this point that I revert to a discussion of the sword and shield which symbolize the role of our Armed Forces.

This concept of the dual role to be performed by our Armed Forces can be illustrated best by consideration of the military situation in Western Europe. In this area we stand ready with our NATO allies to resist aggression by any and all means necessary to prevent its Communization. Because of its strategic and psychological importance, it is an area in which any use of military force would create a highly dangerous situation; dangerous because the stakes there are so high that any military conflict is likely to extend to general war.

Our over-all strategy in Western Europe has been to station ground forces as a shield across Western Europe, capable of resisting a surprise attack and of holding the enemy at arm's length long enough to permit the application of the destructive power of our retaliatory forces. Generals Gruenther and Norstad, successive commanders in this area, have estimated the need of 30 divisions and supporting tactical air forces to constitute this indispensable shield. The United States Seventh Army, a force of five divisions, constitutes an important part of this defensive force. We give the highest priority to the maintenance of the readiness of this army. It is the first to receive our newest equipment and it is always held at a high level of personnel strength. We are very proud of this force and consider it one of the best field armies in existence today.

Thus the ground forces and supporting air forces are the shield required to obtain time in case of general attack in Western Europe. The sword is represented by the United States and allied air forces which with their bombers and missiles have the mission and the means to destroy the aggressor while his progress is being held up on the ground. Thus, the safety of Europe will depend on the successful interplay of sword and shield forces—both indispensable to our general war strategy.

This concept is sound, I believe, when it applies to conditions of general war in an area such as Western Europe. I would now like to point to a curious reversal of roles which exists in situations short of general war.

I hope that I have made clear my belief that the conditions of mutual deterrence fortunately make deliberate general war unlikely, whereas in such a period, limited aggressive actions have an increasing probability. It is for this reason that I often feel called upon to stress the need of assuring our capability of operating at this military level.

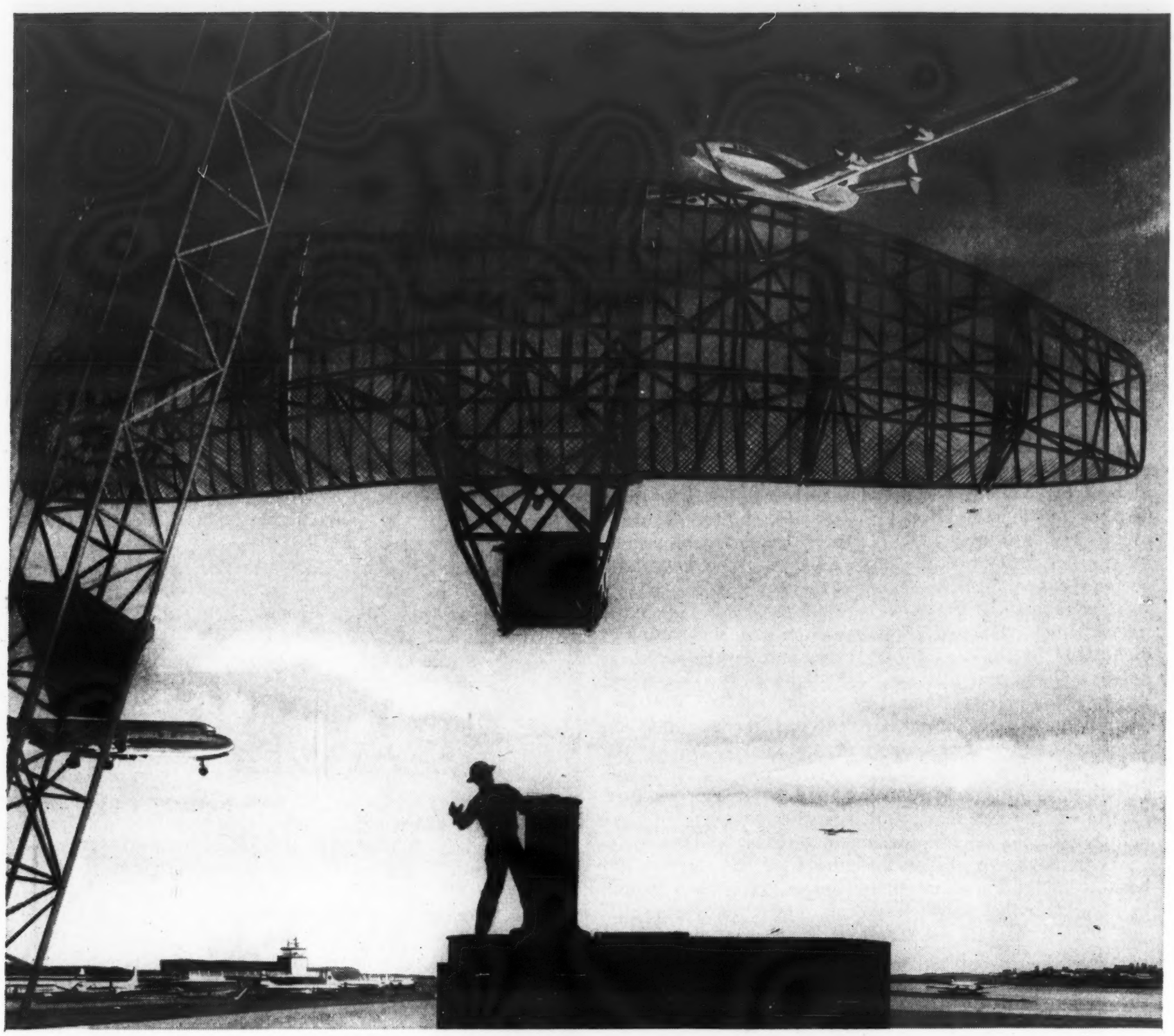
In a period of mutual deterrence, our air retaliatory sword tends to become a shield protecting us from the atomic sword of our potential adversary. The possession of our sword prevents him from using his sword tempered for a similar purpose. At the same time, the Army and tactical Air Forces of the kind which constitute a shield in Western Europe now assume a new importance in the role of mobile strategic forces capable of rapid intervention to resist local aggressions. To perform this important task, these forces must be constantly ready for strategic movement to any threatened point in the world. They must be equipped with the most modern equipment and capable of acting with or without atomic weapons as the situation may require. It is properly said that in the American Army atomic weapons are now conventional weapons and organic parts of our unit equipment. Nonetheless, we recognize that there may be limitations imposed upon their employment. In most of the hypothetical situations in which we consider it possible that we may use our land forces, we would be fighting in friendly countries to aid an ally. Under these conditions atomic weapons would have to be used with great care and discrimination to avoid great damage to those whom we wish to assist.

The geographical location of these mobile strategic forces for use in limited war is, of course, of great importance. It would be well to have some of them in forward locations conveniently located near areas in which they might be called upon to intervene. As this forward displacement is not always possible, the bulk of these forces must be maintained in the United States. The Army includes as its primary contribution to this mobile sword, the Strategic Army Corps which contains the top priority divisions and supporting troops which we would send first to a scene of emergency. We keep these divisions constantly ready to move either by air, sea or a combination of both. It is the need to give mobility to this force which causes us to be so vocal in our insistence upon the requirements of strategic movement. The Army does not control the means necessary for such movement. We are hitchhikers of the Air Force and of the Navy. We look to our air and naval colleagues to maintain in readiness the means of transport which we would require, and stress the need for careful joint planning and training to assure our speed of reaction.

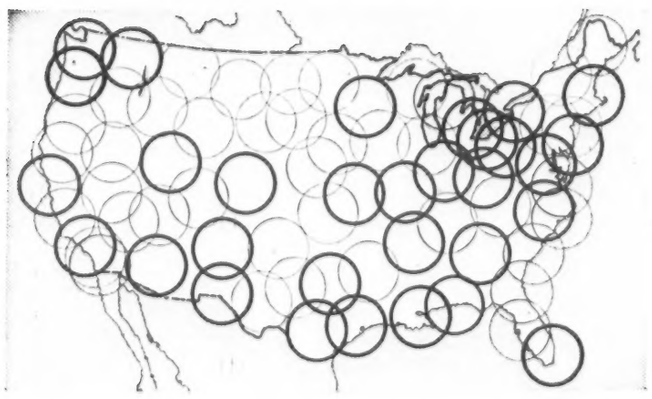
The requirements for responding to limited aggression provide a justification for our concern over the military capabilities of our allies. Our Military Aid Program is directed toward the creation of sufficient strength in many friendly lands to assure internal stability and to provide an initial defense against external aggression. These indigenous forces which we assist have an important role to play as a part of the shield for their own countries. In a crisis, we hope that this shield will be strong enough to gain the necessary time for the arrival of the forces of the sword necessary to stabilize and restore the local situation. Representatives of the United States Army are today engaged in assisting directly or indirectly in the training and development of over 200 foreign divisions in 44 countries which are an important contribution to the defensive shield of the Free World.

In summary, our strategic requirements in an era of mutual deterrence require a dual concept of the relation of sword and shield. To deter general atomic war we must have a shield of ground forces capable of effective defensive action on the ground. At the same time we must maintain

(*Continued on page* 11)



Getting set for jet-age traffic at 27 leading U. S. airports



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NATIONAL AIMS and SPACE POWER

by Maj. Alexander P. de Seversky

Maj. de Seversky's article will appear in two installments. Part II will be published in the May issue of SIGNAL.

WITH THIS ARTICLE, I BELIEVE I am expected not to impress you with my knowledge, but to be a goad, a pebble in the shoe, and to provoke a vigorous discussion. And, frankly, I sincerely hope that it is due to the latter consideration since it simplifies my problem. I don't have to labor in an attempt to be profound.

Our country stands again at a crossroads. What we do now will decide whether freedom or slavery will permeate the world in the not too distant future. It all depends on how efficiently we organize the total resources of our Nation to meet the challenge of this era when the atom and the electron have been harnessed as military tools to be projected through air and space at hypersonic speeds.

Our national aims are clear. We yearn for a free world in which justice and the dignity of man prevail. But yearning by itself is not enough to gain our goal. That is why even eight years ago I was compelled to state: "Communications and transportation have shrunk this planet to such a degree that the permanent coexistence of two violently opposed social and moral systems has become difficult, if not impossible. Either one ideology will succumb to the other through persuasion, infiltration and subversion, or a military showdown will become unavoidable."

Since then the differences between the ideologies have, if anything, sharpened. We are witnessing the complete dichotomy of the world into incompatible, antagonistic halves. Geographically, we are divided into East and West; ideologically, into Communism and Capitalism; technologically, economically and militarily, into two opposite camps—one dependent primarily upon the U.S.A., the other upon the U.S.S.R. Under the impact of a cold war, these two opposing masses acquire an even greater energy potential, and it is only a matter of time before a discharge may occur in its most violent form.

We must never forget that the Communists did not hesitate to liquidate twenty million of their own people to perpetuate themselves in power. The same regime will not hesitate to kill off twice or thrice that number of people, anywhere, to achieve by force its goal of world domination, should its present methods of infiltration and subversion fail.

National Defense First Consideration

It is inconceivable that two opposing and irreconcilable ideologies can be expected to live in peace and blissful coexistence, while at the same time arming to the teeth in the greatest weapons race the world has ever known. An eventual military showdown seems all the more probable when one side is equally determined to retain its freedom. Those who assume that atomic war is impossible because it is too horrible to contemplate are indulging in wishful thinking. If history is any indication, the prospect of more horrible destruction in a new kind of war has never stopped the human race from using force. National defense, therefore, must be uppermost in our minds.

Everybody agrees that a free people must be invincibly strong; yet there seems to be no agreement as to how we should achieve that strength.

Weapons and tactics are the province of specialists. It is only prudent that their details be kept secret. They are the province of the Military and the industrial fraternity. But over-all strategy, like any other national policy that affects our entire Nation, is the province of the people. In any case, strategy cannot be kept secret. It is evident from the size and allocation of appropriations and from the country's industrial effort. A free society cannot win a war by deception or surprise. Our strength must be inherent and obvious to all. In a republic such as ours, the Government is helpless unless it has the benefit of enlightened public opinion. And that opinion can never be formulated unless the American people have the unadulterated facts.

Since the last war, new discoveries and inventions have rained down on our heads in great profusion. Scientific claims and counterclaims by experts and people in authority have become so divergent that the man on the street is too confused to think objectively in the area of national defense.

Space hysteria can be detected in some quarters. Public figures, who only yesterday refused to recognize even air power as a decisive military force and insisted that any future war would be won by men with bayonets crawling through the mud 3000 miles away from home, have turned an intellectual somersault. They now proclaim with pomposity that, in order to survive the Communist menace, we must forget about earthly weapons and immediately acquire space power in order to control global weather, to cause droughts and floods, to change the tides and

raise the levels of the seas, and to divert the Gulf Stream and change the temperate lands to frigid.

Space Science Not Fiction

There are also those who say that we must abandon everything and rush pell-mell into space because whoever puts the first manned satellite into orbit will control the world. But it simply won't work that way militarily. If you can put a satellite into orbit, then you can shoot it down. So even that kind of war will resolve itself into a war of attrition. Whoever gets there "fustest with the mostest" satellites will win the war.

And, finally, there are the "space Mahans" who feel that the only answer to Russian aggression is to gain control of outer space into infinity. They say we must occupy the moon and other planets as space bases from which to shoot the Russian Bear. I am among the first to recognize that space science is no longer fiction, that this last frontier is now fully open for conquest. We, as a great Nation, must meet the challenge and regain the leadership in matters technological and scientific and astronautical. But, at the same time, I cannot help but feel that the true conquest of space and the exploration of the universe that stretches endlessly beyond the gravitation of the earth will be a concerted effort of our planet *after* the ideological impasse that now plagues the earth has been resolved.

So, let's get down to earth—for, in the interim, if we are not realistically prepared, we can be destroyed in several ways far more prosaic than those mentioned just now.

Three Years Behind

Now let us briefly take stock of our present position vis-a-vis the U.S.S.R. As far as the missile and satellite field is concerned, our position is assessed differently by different people. Some hold the optimistic view that we are in a nip and tuck race. Others give us the grim warning that it will take us at least five years to catch up with the Russians. Personally, I think we are at least three years behind, and this is why:

The Soviet's spectacular display of rocket power is not the only example of their extraordinary advance in military technology. In our excitement over man-made satellites, we overlook other symptoms which, if evaluated properly, call for grave concern.

Let us take, for example, the field of air transportation in which the supremacy of the United States has not been challenged since Lindbergh flew the ocean. As of today, our airlines are planning to switch to jet transports some time in 1959. At the moment, we have only one Boeing 707 demonstrator that has not yet even begun trial scheduled runs. The Russians, on the other hand, as of last November, had delivered to their airlines fifty TU-104 jet transports. These planes have now been in regular airline operation for nearly two years. Krushchev, Bulganin, and even less important Red officials are flying through the air with the greatest of ease in slick jet aircraft. This naturally impresses people everywhere with Russia's technological superiority and has just as great a propaganda impact as their Sputniks because these planes are something they can see and touch with their hands. By comparison, our President, Secretary of State, and other representatives of our great country are still lumbering around in old-fashioned fan-driven aircraft.

The Russians are also delivering to their airlines the TU-110, a 4-engine jet comparable to the Boeing 707 and Douglas DC-S. It will fly non-stop from Moscow to New York. Their TU-114, the "Rossia," is the largest turboprop aeroplane in the world. It is capable of carrying 250 passengers on a short haul or 175 across the oceans. What is more ominous, technologically, is that its power plants in production are rated at 12,000 equivalent horsepower each. We simply haven't got such an animal. These commercial aircraft produced by cheap labor are bound to be thrown on the world market probably at something like 50 per cent discount—something we will have to reckon with in so-called competitive peaceful coexistence.

Because of Russia's lead in jet propulsion, the military aviation picture is not any rosier. The operational aircraft of the United States Air Force are powered by engines of, on the average, 10,000 lb. thrust, while the Russian air force is powered by engines of 20,000 lb. thrust. Recently, they increased the rating of this engine to 22,000 lbs. Considering equal aerodynamic knowledge, it is only logical to assume that such an excess of power available to the Russian air forces is a guarantee of their superior performance, in all classes of aircraft. Most of these are surely supersonic. Under the circumstances, the Soviet intercontinental bomber is certain to be at least as good as our B-52, and indications are that, by now, they have more of them. It is clear to me that Krushchev's statement that jet bombers are already museum pieces is nothing but military propaganda. No doubt he knows better, and made the statement with his tongue in his cheek. With Soviet long-range bombers coming off the production line at a rate greater than ours, Krushchev's outburst might have been a cunning ruse; while we strain every effort to achieve parity with the U.S.S.R. on the ICBM by 1962, we may be forced to do so at the expense of our Strategic Air Command in being. Meanwhile, Russia may attack us with jet aircraft at any time before that date and smother us like a cloud of locusts.

USSR Electronic Defense

We must never forget the way we smothered Germany in 1945 with wave after wave of our ten-year-old crates such as the B-17 and B-24, in spite of Hitler's V-1 gyro-guided missiles, V-2 ballistic missiles, jet aircraft, rocket interceptors and other scientific novelties.

Furthermore, a recent report indicates that Russian electronic defenses are more dense and at least as good, qualitatively, as ours. This electronic capability, coupled with their proven prowess in rocketry, may provide them with a formidable continental defense shield which means that our Strategic Air Command must be greatly expanded to compensate for the resulting increase in the rate of attrition.

I have personally listened to several Russian broadcasts during the past six months which indicate that their electronic industry is rapidly being transistorized and miniaturized. Thus, our hope that we can rely on our smaller satellites to provide us with greater information may be short lived.

In the field of atomic propulsion, we have no information as to whether the Russians have built nuclear submarines. But, since they *have* launched the first atomic-powered surface vessel, the icebreaker *Lenin*, it is only prudent to assume that they have the necessary know-how. In the meantime, they have created a large schnorkel-type submarine force in being that has the necessary range and missile capacity to participate in a well-timed nuclear attack on our country.

But to endeavor to match the number of Russian submarines is not necessarily logical. This force must be developed in accordance with our own strategic requirements. We must not forget that Russia's industrial complex is deep within its land mass, whereas ours, and that of our allies, is deployed along the shoreline. It has been estimated that as much as 80 per cent of our industrial capacity, therefore, is within the reach of Russian submarines. Basically, any expansion in efficiency of submarine warfare favors the enemy, not us. Therefore, I feel that we must exert our utmost scientific effort to solve the problem of detection and surveillance of these sub-

(*Continued on page* 11)

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- CONSTANT DELAY LINES
- TEST EQUIPMENT

The activities referred to in this advertisement

Strategy of Sword and Shield (*Continued from page 6*)

an awe-inspiring air atomic sword clearly capable of destroying an aggressor who initiates general atomic war.

In contrast, in order to cope with the more probable threat of local aggression, we require a shield constituted by our air retaliatory power, which holds in check hostile forces of similar character. This shield also includes the ground forces of our allies capable of imposing delay upon any aggressor who may violate the integrity of their territory. The active sword, however, is represented by strategic mobile forces of the Army, Navy, transport and tactical Air Forces which are capable of displacing rapidly to threatened points, arriving in time to suppress promptly a dangerous situation which, if unattended, might expand into that general conflagration which it is our interest to avoid. This interchangeability of roles under conditions of general and local war leads me to this final conclusion.

The requirements of military security in this age of megaton weapons requires us and our allies to maintain a proper balance of offensive and defensive strength. While every military man is instinctively inclined to stress offensive strength, it is unsound to disregard the requirements of the shield. Indeed, we have noted that often the shield becomes the sword and the sword the shield, a reminder that we cannot afford to neglect any portion of our balanced forces which have a role to play in our program of deterrence.

In discussing the shield requirement in general war, I discussed only the situation in Western Europe. For completeness, I should allude for a moment to the shield requirements in the United States. I refer, of course, to the requirements for the air defense of our homeland. Here the shield forces comprise elements contributed by all three Services—the aircraft of the Air Force and the Navy, and the antiaircraft batteries of the Army. These latter are now becoming entirely surface-to-air missile units represented by the first generation Nike Ajax missile and soon to be replaced by the vastly improved Nike Hercules. Insofar as these defensive forces convince a potential aggressor that he can strike American targets only after taking prohibitive losses, they are an important contribution to deterrence. While no defensive system will ever be a hundred per cent effective, I must say that the possibilities of a missile defense of the United States have, in my judgment, increased to an encouraging degree. We see the possibilities not only of a strong defense against supersonic bombers, but even against ballistic missiles. The Secretary of Defense has recently taken over the direction of the antimissile-missile program, to which the Nike Zeus system is the Army's contribution. I may be overly optimistic in my attitude toward the possibilities of an antimissile defense, but I feel that it is an area in which we cannot afford to act other than optimistically. It is vital to our deterrent posture to achieve a defensive response to the growing long-range missile threat of the Soviet Union.

In closing, let me sum up the thought which I would like to leave with you. We have entered a period of mutual deterrence where both sides of this bipolar world have the concurrent capability of destroying one another in general atomic war. Under such a situation, both sides will be most careful to avoid taking any action to bring on general war. However, the Soviet bloc, based upon past performance, is likely to take advantage of this condition of increased level of provocation to indulge in continued hostile acts to the detriment of our common cause. To respond to these provocations, our security forces must provide a proper combination of capabilities arising from the sword and the shield. The sword forces are generally those which are counter-offensive and retaliatory in nature. Those of the shield are generally defensive and time-winning in their military role. However, the forces of the sword are different in character under conditions of general war and under conditions short of general war. There is a reversal of roles depending upon which one of these two situations confronts our forces. Thus it is that I am impressed with the need for flexibility and versatility on the part of the forces of all three Services, as no one weapon, no one strategy, no one tactic is capable of guaranteeing our security. Rather, we need a balanced strategy of sword and shield capable of execution by versatile forces with an ambidexterity adequate to the complex nature of the challenge which confronts us.

National Aims and Space Power

(*Continued from page 9*)

mergibles. Our answer must be intellectual. We must endeavor to achieve a scientific breakthrough and make water transparent, figuratively speaking. Deprived of its natural concealment, the submarine will become a helpless target of air power. Thus, the best way to deal with this Russian menace is to nullify the gigantic effort which the U.S.S.R. is devoting to this form of attack.

So, the over-all immediate picture is not very optimistic. I agree with the President that, currently: "The United States is maintaining the most powerful military establishment in our peacetime history." But because of the facts I have outlined, I am compelled to conclude also that never in our history, whether at war or in peace, have we been so weak in relation to our potential enemy.

Technological Brain Power

What is the cause of our present technological tardiness? Could it be a dearth of scientific and engineering talent? Or lack of production know-how? Of course not. I can state with assurance that our weakness is not inherent. We are still the greatest industrial power on earth and nothing would be more dangerous than the loss of faith by the American people in their technological superiority. Strategies can be changed. Organizations can be revised. Individuals can be replaced. But there is no substitute for native ingenuity. Nor is there any need for us to worry on that score. With 650,000 scientists and engineers in our midst, as of today we lead in the technological brain-power pool, though we must admit that Russia is catching up with us dangerously fast. If we grasp the causes of our plight and react promptly with characteristic American vigor, we can regain our leadership in military technology.

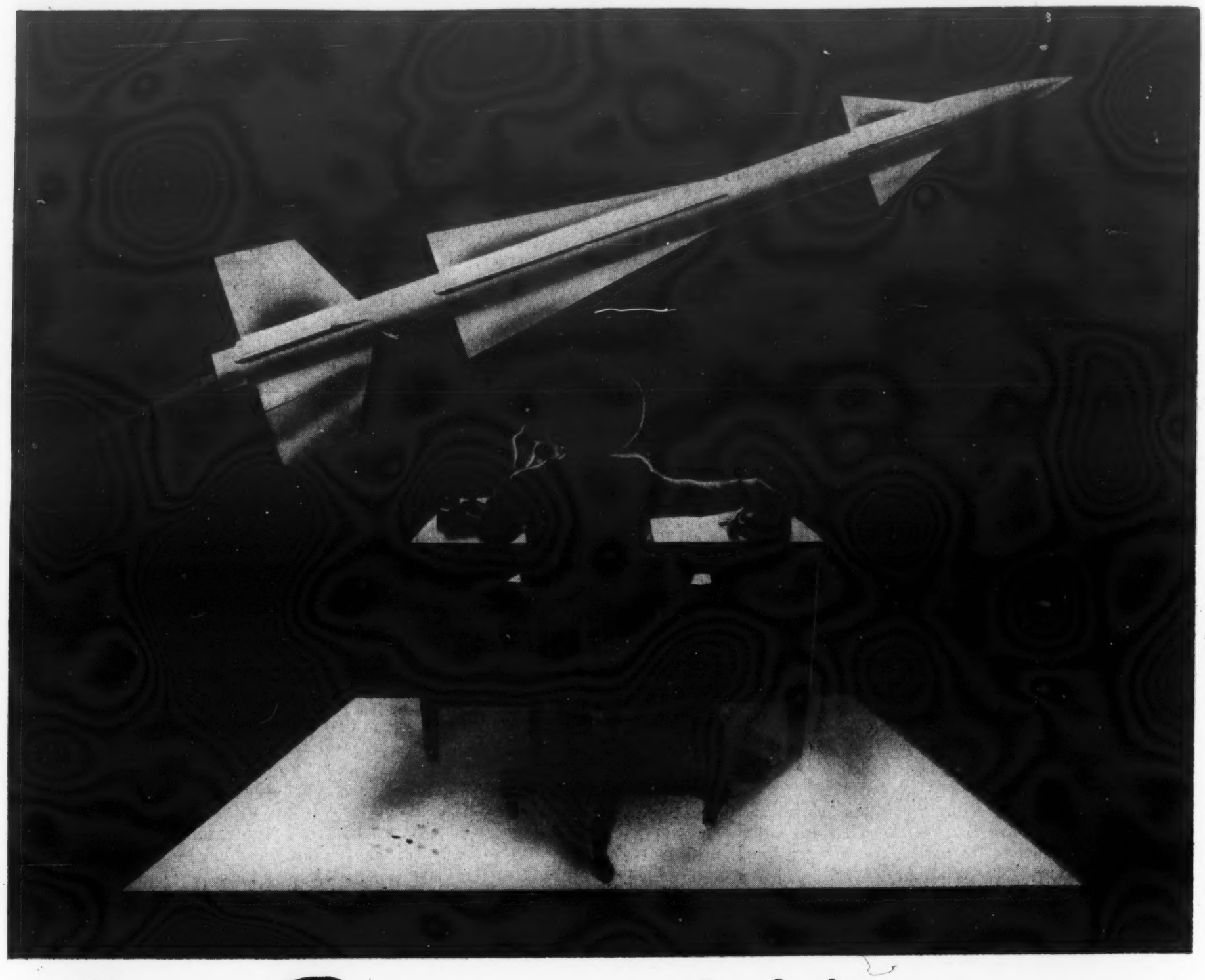
The reason we have reached a state of inferiority vis-a-vis Russia in some respects is *not* that there is anything wrong with American scientific creative genius, but that our talent is condemned to labor within the confines of an outmoded, fallacious strategic framework.

Our plight is a historic one that has plagued victorious nations in the past. In preparing for a new war, we cling to the methods of the past which proved successful. The current controversy between the Republicans and the Democrats to fix the blame is meaningless. We are all at fault. The whole defense philosophy of our Nation is out of step.

Instead of developing a new strategy that takes full advantage of the new technology, we are trying to cram the new technology into the old strategic pattern. We waste our industrial know-how, our scientific and engineering talents—the most precious commodity we possess—on all sorts of irrelevant military projects that have no relation whatsoever to the kind of war we may have to fight in the air and space above.

As in the last war, we go blissfully along developing three separate, unrelated strategies and dividing the available scientific talent, both domestic and foreign-born, on a sort of catch-as-catch-can basis. We are building in every direction, trying to be strong everywhere, scattering our scientific and industrial effort over the entire spectrum of weapons from invasion barges to Sputniks. As a result, we are weak everywhere and, by default, are surrendering to the enemy our military technological leadership in the decisive field of air and space warfare.

(*To be continued in the May issue*)



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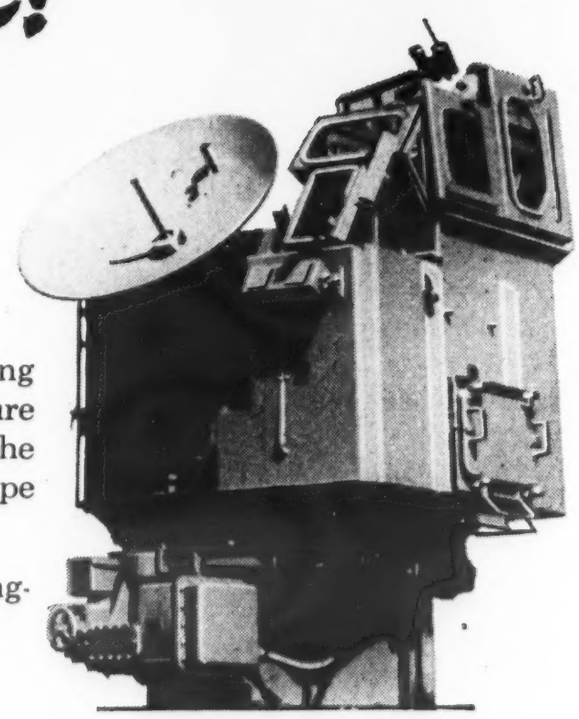

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COMBAT SURVEILLANCE

today and tomorrow

by Brig. Gen. William M. Thames, Commanding General
U.S. Army Combat Surveillance Agency

IMPERATIVE TO COMMAND control of military forces in any future warfare is knowledge of every position and movement, hostile and friendly, in the combat area—a battlefield that may include thousands of square miles and be hundreds of miles in depth.

Tactical units will be relatively self-contained and employed over extended areas, but able to assemble rapidly, apply their total force and rapidly disperse.

To exploit their mobility and firepower, the combat commander must have up-to-the-second information about the disposition, nature and movement of both hostile and friendly forces in the area. And this information must be provided continuously and systematically, by day and by night, under all conditions of weather.

This is the singular and important task of a combat surveillance system —*any* combat surveillance system.

It is not a new activity, nor a recent technical development, although it incorporates many new techniques and operations, both technical and nontechnical.

It is the collective assembly, the coordinated aggregate, that constitutes a combat surveillance system.

Such a system uses radar, infrared, sonic and photographic means of communication. It uses meteorological equipment, remote sensing devices, reconnaissance drones and other methods of collecting information. The system includes the facilities required to process and apply this collected information rapidly and effectively to be of most use to the combat commander.

The system has an all-weather, day-and-night capability — functioning adequately under any and all conditions of light, temperature, clouds, fog, smog, haze. rain and snow. And it covers a wide area in accordance with an orderly, continuous, coordinated pattern.

The Army has always had a need for combat surveillance, and has always conducted reconnaissance, observation, and other surveillance activities. Only recently, however, has the Army thought in terms of an *integrated* combat surveillance *system.*

The need for an integrated system grew out of several fundamental changes in the doctrine for ground maneuver and fire support, all directly related to the advent of mass destruction weapons.

The greatly increased fire power of atomic weapons permits us to reduce the size and streamline the organization of our infantry and armored formations; the possible use of mass destruction weapons by the enemy dictates great dispersion of our forces on the battlefield. These considerations have been reflected in the reorganization of infantry and airborne divisions at about two-thirds their former strength, with five battle groups in each division replacing the three infantry regiments in the old division. The impact from a combat surveillance point of view is that, despite their smaller size, these divisions will be responsible for greatly increased frontages and will deploy to much greater depths than in the past. This means that within the division area there will be many small islands of troops which may be separated laterally and in depth by distances of several miles. These distances between troop units are too great to be kept under continuous surveillance by either ground patrols or air observation—particularly during darkness or adverse climatic conditions. The requirement for surveillance of the entire division area of responsibility will not be decreased even while the division commander temporarily concentrates his troops preparatory to launching an attack.

The new divisions, being smaller and more widely dispersed, are being provided improved means of communications and greater mobility to enable commanders to control their units while dispersed, assemble them rapidly, apply their total force, and then rapidly disperse. Advances in command control and mobility will correspondingly reduce reaction time when an enemy weakness is discovered. Thus, an even greater premium than ever before is placed upon the speed with which information about the enemy is obtained and presented to the commander to enable him to exploit promptly transient enemy weaknesses.

The requirement for an improved combat surveillance system grew out of the need to bring our target acquisition capability closer to that of our weapons systems. In World War II and Korea, Army weapons could fire to a maximum range of about twelve miles beyond our front lines, and the Army had a commensurate target acquisition capability in the form of ground and air observation posts and certain sound and flash counter-battery detection devices. Today, however, the Army is developing weapon systems that can fire to ranges well over one hundred miles. The development of these delivery systems has outstripped development of the means for target acquisition. Thus, we are faced with an urgent and immediate need to develop for inclusion in the combat surveillance system a capability to collect target information at distances commensurate with the range of our weapon systems. This capability must provide for detection, identification and location of a target with sufficient information to permit target analysis and preliminary fire planning. In addition to these basic requirements for target acquisition, we must achieve a capability to fix the three-dimensional location of a specific target with reference to a point of known location, and with sufficient accuracy to permit production of firing data for the weapons system.

Accomplishments

Project MICHIGAN, a joint Army-Navy-Air Force research and development project on combat surveil-

(*Continued on page* 15)

MISSILE COMPONENTS Bulova safety and arming systems protect ground, air and sea crews from load to launch, then take over in flight. Safety factor of one in a million is specified and reliably delivered by Bulova's precision production facilities. Powder-driven gyros and fuzing systems are among other Bulova developments for 18 key missiles.

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INFRA-RED COMPONENTS Bulova infra-red cells are designed to unerringly guide Sidewinders to target. Bulova-improved production processes increase yield and product reliability. Other infra-red developments include filters, reticles and thermistor bolometers, as well as advanced research in mosaic and lead selenide cells.

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Combat Surveillance

lance, was begun in 1953 at the University of Michigan. The Project, under prime contract with the U. S. Army Signal Corps, is engaged in system concept studies as well as basic research and development of technical detection subsystems.

A new intelligence organization has been developed to support the field army. Under the new organization, all the intelligence specialists have been placed in a military intelligence battalion organic to the field army. Intelligence specialists required to support corps and divisions are provided in detachments which are attached to the supported unit. This streamlines the intelligence organization and provides for a measure of centralized control at the field army level without detracting from the intelligence capabilities of the subordinate corps and divisions.

The Army Map Service is engaged in a world-wide program to produce maps with the requisite scale and geodetic control to permit locating targets with an accuracy commensurate with the accuracy of our new weapons systems.

The Army, through the Navy and Air Force, is continuously developing improved reconnaissance aircraft to obtain the range, performance and configuration required to support the combat surveillance program. Experiments and tests are also being conducted on utilizing Army aircraft to extend the range of operations of ground reconnaissance patrols by landing men and vehicles deep behind enemy lines.

The combat surveillance program of the Signal Corps has the highest priority of all Signal Corps research and development programs, since it has the responsibility to develop and provide the technical equipment systems to give the field army a combat surveillance capability meeting the requirements of modern warfare.

Early in 1957, the U. S. Army Combat Surveillance Agency was established in Washington, D. C. This Agency is responsible for directing and supervising the Signal Corps effort in all phases of combat surveillance, and also for coordinating with the combat surveillance activities of other Army agencies, the Air Force, and the Navy. The Agency is now developing over-all concepts and guidance for the Signal Corps, while at the same time trying to collect and digest information on past projects and actions. Today the Combat Surveillance Agency the Army's focal point for combat surveillance.

The U. S. Army Signal Engineering Laboratories at Fort Monmouth have reoriented their programs to place greater emphasis on combat surveillance. They perform basic and applied research, and they design and develop all Signal Corps equipment to meet the Army's requirements. Approximately a third of their effort is now directed toward combat surveillance.

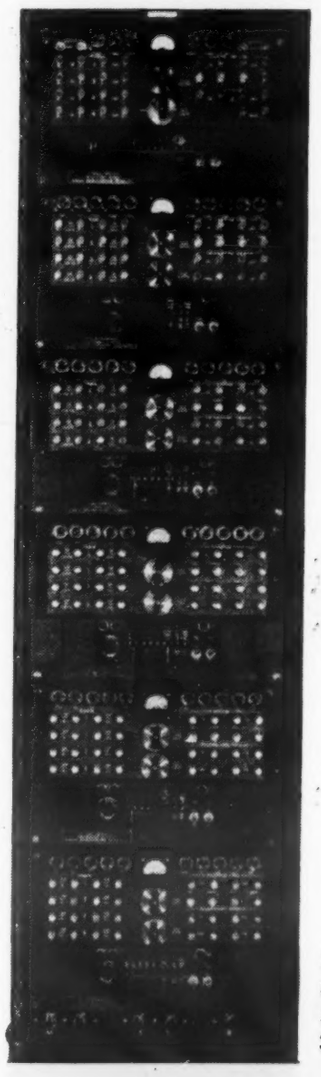
The U. S. Army Electronic Proving Ground at Fort Huachuca, Arizona, has been devoting about a third of its effort in support of combat surveillance for several years. The Combat Surveillance Department at the proving ground is responsible for conducting tests of surveillance equipment and developing organizational and operational concepts for surveillance equipment systems.

The Military is not capable by itself of solving all the problems it faces in the development of a modern combat surveillance system. As always, to solve particularly knotty technological problems, the Army depends heavily on civilian research organizations and private industry. Teamwork between Army and industry has solved many difficult problems in the past and undoubtedly this will be equally true in the area of combat surveillance.

There is considerable equipment under development by the Signal Corps, and there are areas in which improvements need to be made to meet the requirements of a modern combat surveillance system.

A Signal Corps program has been under way for the past several months to develop a facility known as the Tactical Operations Center. The purpose of this equipment is to provide the field army commander with information, in readily usable form, needed by him to arrive at sound decisions in the command of his forces. Filtered data concerning all aspects of the tactical situation and the support means available will be received in the center, processed, and stored in readily accessible form. As the need arises, the data, much of which will be obtained by combat surveillance, will be displayed in a manner appropriate for the use of the commander and his immediate staff.

The technical means employed to collect intelligence extends man's natural senses, enabling him to detect the enemy in the dark, through camouflage, under all weather conditions and at great distances. There are many potentially valuable techniques for surveillance. Some, basically visual, present their intelligence



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to the eye in a directly recognizable form. These include night glasses, light amplifiers, photography, infrared viewers and television. Other devices translate phenomena man cannot sense himself into visual or audible signals: detecting sub-audible sounds, seismic disturbances and radio frequency radiation such as that caused by vehicle ignition, enemy radar, communications equipment and atomic bursts. Still other electronic aids permit mapping of emitted or reflected microwave radiation. The electrostatic or electromagnetic properties of tanks and vehicles can be detected, as can nuclear radiation and chemical atmospheric changes caused by enemy activity. Finally, meteorological measurement of wind, temperature, humidity and pressure assist surveillance.

The characteristics of the various sensing devices generally supplement each other. For example, some devices can give accurate range information; others provide only general information, but at greater distances; some are limited by weather conditions; others have a comparatively low inherent resolution. In addition, some are active devices subject to detection and are thus vulnerable to countermeasures. No single device will fill the bill. What is required is an integrated family of equipment subsystems which complement each other, and which provide adequate coverage, commensurate with the weapons systems at each level of command, without gaps and with a minimum of overlap and duplication.

Surveillance sensory devices fall into two broad categories—ground based and airborne. In general, the various technical means of surveillance can be adapted or modified for use as either ground-based or airborne devices. Ground-based devices for front line troops must be capable of being carried by hand. Ground devices to support higher echelons may be vehicle-mounted. Airborne devices must have a size, weight and configuration compatible with the aerial platform to be used. As mentioned previously, the Army is seeking to obtain aircraft with improved range, performance and configuration characteristics.

The Signal Corps is also conducting an extensive program to develop drone aircraft at the U. S. Army Electronic Proving Ground at Fort Huachuca. The drone currently being tested is an adaptation of the standard target drone, known as the RP-71. It has an eleven-foot wing span, a speed of 185 miles per hour and is capable of carrying about 70 pounds of photographic equipment. It is launched with JATO (jet-assisted take-off) from a zero length launcher and is recovered by parachute. Although this drone is limited as to the weight it can carry and its operational range, the tests conducted have established the feasibility of drone aircraft as platforms for surveillance devices. The use of this type of surveillance necessitates means for determining the exact position of the drone when it acquires surveillance data. Signal Corps contracts have been let for the development of larger, higher performance drones, with improved tracking and control systems.

Photography, especially air photography, has long been one of our best means for obtaining information of the enemy and terrain at great distances. Considerable advances have been made or are under development. Air-dropped photoflash cartridges now provide the necessary light for night photography; however, greatly increased film sensitivities are expected to permit night photography without artificial illumination. It is desirable that future airborne photography employ in-flight film proc-

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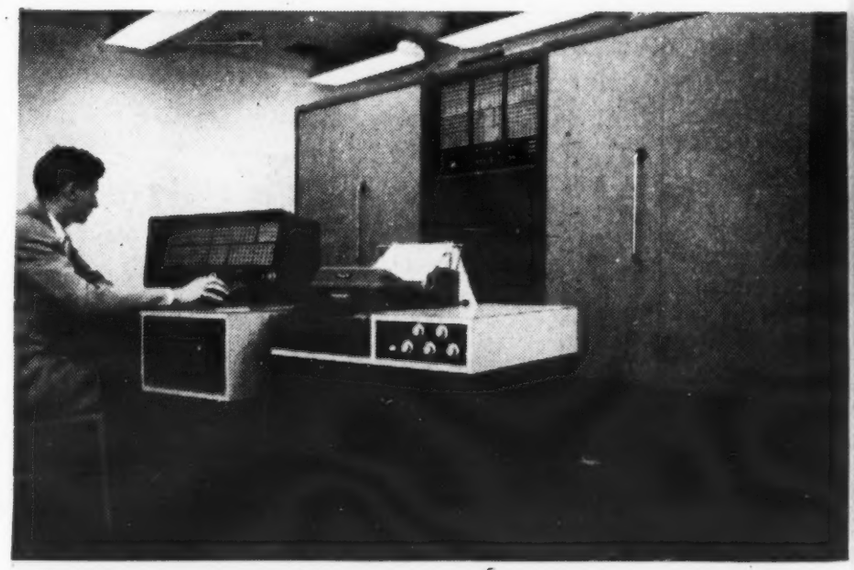
"DATATRONS" CROSS U.S. IN NORTH AMERICAN VANS

High-speed electronic computers made by Electro-Data Division, Burroughs Corp., travel door to door uncrated in smooth-riding North American vans. Left, unit being loaded at Pasadena plant. Right, "Datatron" ready to go to work. (North American recently moved entire Electro-Data Division to new 40,000 sq. ft. plant in California — another widely used industrial service offered by the world's leading van line!)



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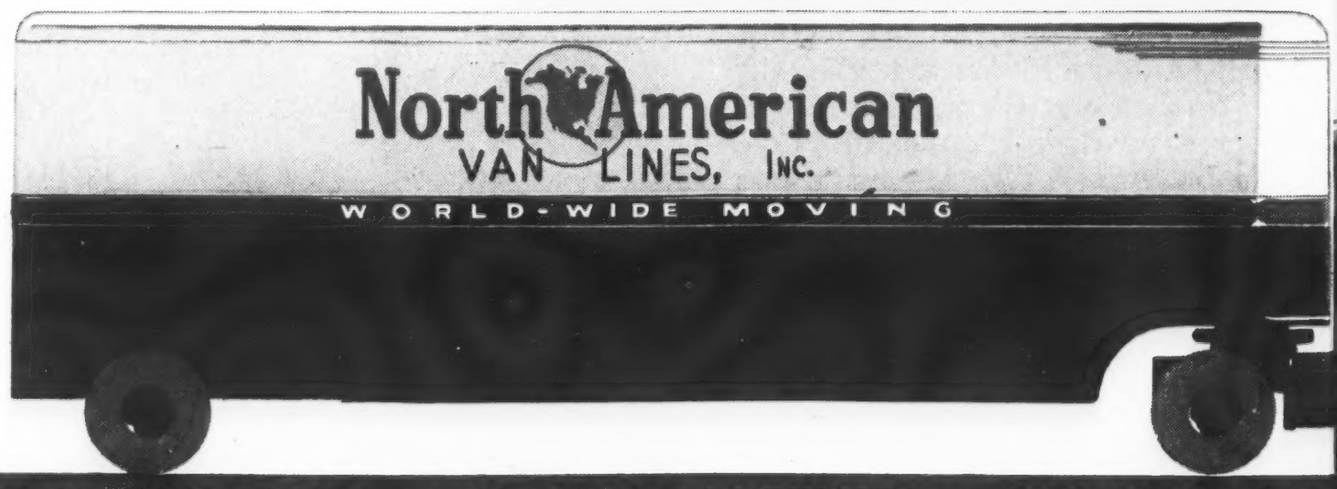

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essing and transmission of pictures to speed up the acquisition of data and to avoid the possibility of its loss should the air vehicle not return to base. Colored air photographs would provide commanders a more natural presentation of the terrain and reduce the effectiveness of enemy camouflage.

Television is a medium which offers many possibilities in the field of combat surveillance, although, to date, no practical application has been developed. The challenge to airborne television and photographic telemetry is the requirement for sufficiently high resolution in the ground display to enable the location of significant targets against the background. In addition, television equipment for airborne use must be made lighter and less complex and must be better stabilized. The use of television may be extended to lower light levels by light amplifiers and more sensitive pickup tubes.

In the field of radar, a family of ground-based pulse doppler equipment systems has been developed, both hand portable and vehicular mounted, some of which are capable of detecting moving targets to distances beyond ten miles. These ranges can be considerably extended if the current line-of-sight limitation can be overcome. For mortar location, a new two-beam scanning radar is nearing production. Airborne radars offer considerable promise not only in the detection of moving targets, but also in the field of terrain presentations. Test models of airborne radars are capable of detecting moving targets and making terrain presentations to ranges well beyond twenty miles. Advances made by Project MICHIGAN in the development of high resolution radar holds promise that radar terrain presentation may eventually approximate that of photography.

Infrared devices are being developed by both the Corps of Engineers and the Signal Corps. Both ground-based and airborne infrared detectors have been developed which can discover the presence and location of tanks and vehicles. Infrared equipment responsive to the thermal flash of artillery and to the shadow of projectiles against the sky are being explored for artillery and mortar location.

Imaging equipment under development offers the promise of faithful terrain presentation.

A technique which promises to have value in the detection of enemy activity would use remote seismic sensory devices which can be air-dropped in enemy territory adjacent to important routes or installations. These traffic counting devices would transmit the accumulated data by radio to a central station.

All of the data acquired by these independent sensory devices must be transmitted to a central station for correlation, storage, and display. Automatic data processing and display equipment must replace hand methods whenever possible to insure that the commander receives accurate, complete and timely intelligence. The Signal Corps has been experimenting with commercial type computers and plans soon to contract for the development of a series of field computers and equipment for the evaluation, display and dissemination of combat surveillance information.

This is the scope and importance of the Army's combat surveillance program, the over-all requirements, progress made and some of the problems which must be resolved. With the cooperation of industry, most of these problems will be solved. And the Army combat commander will be equipped with eyes, ears and nerves adequate to survive and succeed in any future warfare.

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RCA-2N384 "Drift" transistor features a "built-in" accelerating field in the base region to propel charge carriers from emitter to collector. Result... base resistance and collector capacitance are reduced and overall performance is improved. Its unique design makes the 2N384 especially well suited to a wide variety of applications such as: vhf oscillators and amplifiers in compact mobile communications equipment for military and industrial use; rf, if, or low-level-video amplifiers in radio and TV receivers and pulse-amplifier and high-speed-switching circuits in electronic computers.

This VHF transistor has a collector transition capacitance of 1.3 $\mu\mu$f and a low base resistance of 50 ohms. In addition, internal shielding is provided to minimize interlead capacitance and to minimize coupling to adjacent circuit components. These features permit the design of rf circuits having high input-circuit efficiency, excellent operating stability, and good signal-to-noise ratio.

For additional information on RCA-2N384 and other RCA "Drift" transistors 2N247, 2N274, 2N370, 2N371 and 2N372, contact the RCA Sales Office or RCA Distributor nearest you. For technical data on any of these types, write RCA Commercial Engineering, Section D-60-NN, Somerville, N. J.

Maximum Ratings, Absolute Values:
Voltage values are given with respect to base

Collector Voltage	−30 max. volts
Collector Current	−10 max. ma
Emitter Voltage	−0.5 max. volt
Emitter Current	+10 max. ma
Transistor Dissipation:	
At ambient temp. = 25°C	120 max. mw
At ambient temp. = 55°C	70 max. mw
At ambient temp. = 71°C	35 max. mw
Ambient Temperature:	
Operating	71 max.°C
Storage	−65° to +85°C

Typical Operation at Ambient Temperature = 25°C:

	At 10.7 Mc Common Emitter	At 50 Mc Common Base
DC Collector Voltage	−12	−12 volts
DC Emitter Current	1.5	1.5 ma
Input Resistance (AC Output circuit shorted)	400	30 ohms
Output Resistance (AC Input circuit shorted)	28000	5000 ohms
Power Gain*	34	15 db (min)

*Measured in a single-tuned unilateralized circuit matched to the generator and load impedances for maximum transfer of power (transformer insertion losses not included)

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RADIO CORPORATION OF AMERICA
Semiconductor Division **Somerville, New Jersey**

Interference Reduction Program of the Army Signal Corps

by J. J. O'Neil, Deputy Chief, Suppression & General Engineering Branch, Communications Dept., U. S. Army Signal Engineering Labs, Fort Monmouth

THE REQUIREMENT FOR new weapons, systems and tactics for today's Army has necessitated an unprecedented expansion in the use of electronic equipments. With this expansion adequate attenuation of man-made, broad-band interference has become of increasing importance. Whereas it was once considered only another military requirement, interference reduction is now recognized as essential if the degradation and failure of the operation of communications, guided missiles, air defense and battle area surveillance equipments are to be prevented. It is a fact that the required performance of costly, closely integrated electronic equipments cannot be achieved unless suitable precautions are taken to eliminate this formidable problem.

The U.S.S.R. has also recognized this problem, and the Government Office for the Inspection of Electrical Communications under the Ministry of Communications has published "Standards of Permissible Limits of Industrial Radio Interference, Volume IV" (Normy predel'no dopustimykh industrial'nykh radio-pomekh, izdanie chetvertoe). This standard requires all interference producing equipments to be suppressed over the frequency range of 0.15 to 400.0 megacycles and applies to commercial as well as military equipments.

The information presented here should serve to furnish some background, give a quick review of present specifications and of the services performed, briefly outline the current and contemplated interference reduction programs of the U. S. Army Signal Engineering Laboratories and furnish guidance to contractors who are encountering this problem for the first time.

The Signal Corps became concerned with the problem of radio interference reduction when the first communication receiver was installed in an Army vehicle. With the advent of World War II and the requirement for large scale mobile communications operating at increasingly higher frequencies with greater sensitivity, the program quickly expanded. From an effective frequency range of 1.8 to 18.0 megacycles the requirement for adequate interference reduction increased to 30, 40, and finally, to keep pace with communication equipment development, to 160 megacycles. Simultaneously it was necessary that the program be extended to include other equipments in addition to vehicles. This was required as reports from the theatres of operations revealed that untreated engine generators and the wide variety of other engine-driven equipments used by the Army were emanating high levels of interference to great distances and disrupting vital communications. Coupled with this program to assure maximum effectiveness of the interference reduction system, to reduce the logistics problem, to guarantee satisfactory operation of the prime equipment, and to simplify the installation of the system in production, a component improvement and standardization program was initiated. Thus, at the end of World War II all vehicles and miscellaneous engine-driven equipments were suppressed to 160.0 megacycles and many improvements had been made in the components used to obtain the required degree of attenuation.

Added impetus was given to the entire program in 1950 when Army Regulation 105-68, entitled "Communications, Radio Interference Reduction" which delineated the radio interference reduction policy of the Joint Chiefs of Staff, was issued. This regulation included among its requirements the following: "The elimination of radio interference or its reduction in the maximum degree permitted by the state of the art, is an operational requirement for all equipments capable of generating electromagnetic waves procured and used by military forces." In addition it assigned to the Army Signal Corps the responsibility of carrying out the technical aspects of the program for the Department of the Army, including assisting the other Technical Services in solving their interference problems. The issuance of the regulation coincided with the completion of research and development work in the field of interference measurements, and it was possible to increase the effective frequency range requirements from 160.0 to 1000.0 megacycles at that time. The program was again enlarged to encompass electric motor-driven equipments.

The Signal Corps' position in the interference reduction field is unusual as it is neither customer nor user of many of the equipments of which it has cognizance from the standpoint of interference reduction. Great care must be taken, therefore, to prepare specifications which will not restrict unique design requirements of the other services, and yet assure optimum operation of electronic equipment operating in the vicinity. The laboratories' policy regarding radio interference suppression is that all interference-producing equipments should be suppressed to a degree dictated by its intended use and probable proximity to susceptible electronic equipments. This fact is illustrated by the utilization of five different suppression specifications, each defining the type of equipment to be suppressed and the degree of suppression required. Items such as teletypewriters, vibrators, dynamotors and other items closely associated with tactical communication equipments are required to conform to more stringent requirements than, for example, construction equipment which is rarely used in close proximity to electronic equipments.

The Signal Corps is constantly trying to improve the communication range of its equipments and, at the same time, build them smaller and lighter. In general, this is accomplished by designing more sensitive receivers. These receivers will receive weaker signals but will also pick up undesired as well as desired signals when the former are of the same frequency and of comparable strength. These undesired signals are ever present throughout the frequency spectrum and face into two classifications, natural and man-made. The natural "noises" include thermal noise generated in the receiver itself, atmospherics and cosmic noise. The levels of these natural

noises represent theoretical limits in receiver design insofar as sensitivity is concerned, and are closely approached in some Army receivers.

The following performance-type specifications have been prepared by the Signal Corps. Each specification prescribes interference reduction requirements for a specific class or classes of equipments:

(a) MIL-I-11748 entitled "Interference Reduction for Electrical and Electronic Equipment," as its title indicates, is very broad in scope and is applicable to a wide variety of equipments. The specification includes four major classes of equipment with radiation test distances ranging from 3 to 50 feet prescribed for each class. Conducted interference requirements are only prescribed for those equipments which may be operated directly from the same power source as electronic equipments which in this instance are indicated as Class I and Class II equipments. As in all Army suppression specifications, radiated interference requirements are prescribed for the frequency range of 0.15 to 1000.0 megacycles.

(b) MIL-S-10379, "Suppression, Radio Interference, General Requirements for Vehicles," details the requirements for tactical, non-tactical, and vehicular sub-assemblies principally procured by the Ordnance Corps. For tactical vehicles the radiation tests are specified at 3 feet. Conducted interference requirements are specified over the frequency range of 1.5 thru 40.0 megacycles. Tests of non-tactical vehicles are not required as a simple suppression system is prescribed by a drawing. A test procedure for electrical sub-assemblies is also outlined.

(c) MIL-I-11683B, "Interference Suppression, Radio, Requirements for Engine Generators and Miscellaneous Engines," describes the requirements for the wide heterogeneity of equipments driven by internal combustion engines which are used by the Army and generally procured by the Corps of Engineers. Conduction type tests are required for engine generators only.

(d) MIL-S-13237, "Suppression, Radio Interference, Requirements for Watercraft," applies to the numerous tugs, patrol boats, floating repair shops, etc., procured by the Transportation Corps. Radiation tests are prescribed at various locations aboard the craft and conduction tests on circuits which supply power to electronic equipments.

(e) MIL-S-12348, "Suppression, Radio Interference, General Requirements for Railway Rolling Stock and Maintenance of Way Equipment," is applicable to the locomotives, ambulance cars, track ballasters, etc., also procured by Transportation Corps. Radiation tests are required at a distance of ten feet from the equipment and conduction tests for those equipments in which communications are installed.

To assure standardization and reliability of suppression components, four specifications have been prepared, and are incorporated as subsidiary documents to the above specifications. These specifications are as follows:

MIL-C-12889 — Capacitors, fixed paper dielectric.

MIL-C-11693 — Capacitors, feedthru, suppression.

MIL-F-15733—Filters, radio interference.

MIL-S-12944 — Suppressors, ignition interference.

A booklet entitled "Suppliers of Radio Interference Suppression Components" is periodically prepared and distributed to all Army contractors to assist in procuring components approved under these specifications.

Implementation

The Army has long realized that the suppression of radio interference is a highly specialized subject, and that for this reason, it would be necessary that a group of engineering specialists be available to furnish engineering assistance to the contractors of the Technical Services, and conduct interference measurement tests if requirements of the suppression specifications were to be met without delaying production. Following this plan, the Army is assured that all equipments procured are suppressed to the required level; that approved type suppression components are utilized; that the system represented the most economically possible system compatible with the attenuation requirements, and that a maximum degree of standardization is effected, that production of equipment is not delayed due to the contractor's lack of knowledge in this field.

The following is a typical example of the services rendered by the Signal Corps: The Technical Service (Corps of Engineers, Ordnance Corps, Quartermaster Corps, etc.) advises the Signal Engineering Laboratories that a model (experimental, development or pre-production) of a particular equipment has been completed and is ready for investigation of the radio interference suppression system. Engineers are dispatched from the Lab-

(*Continued on page* 22)

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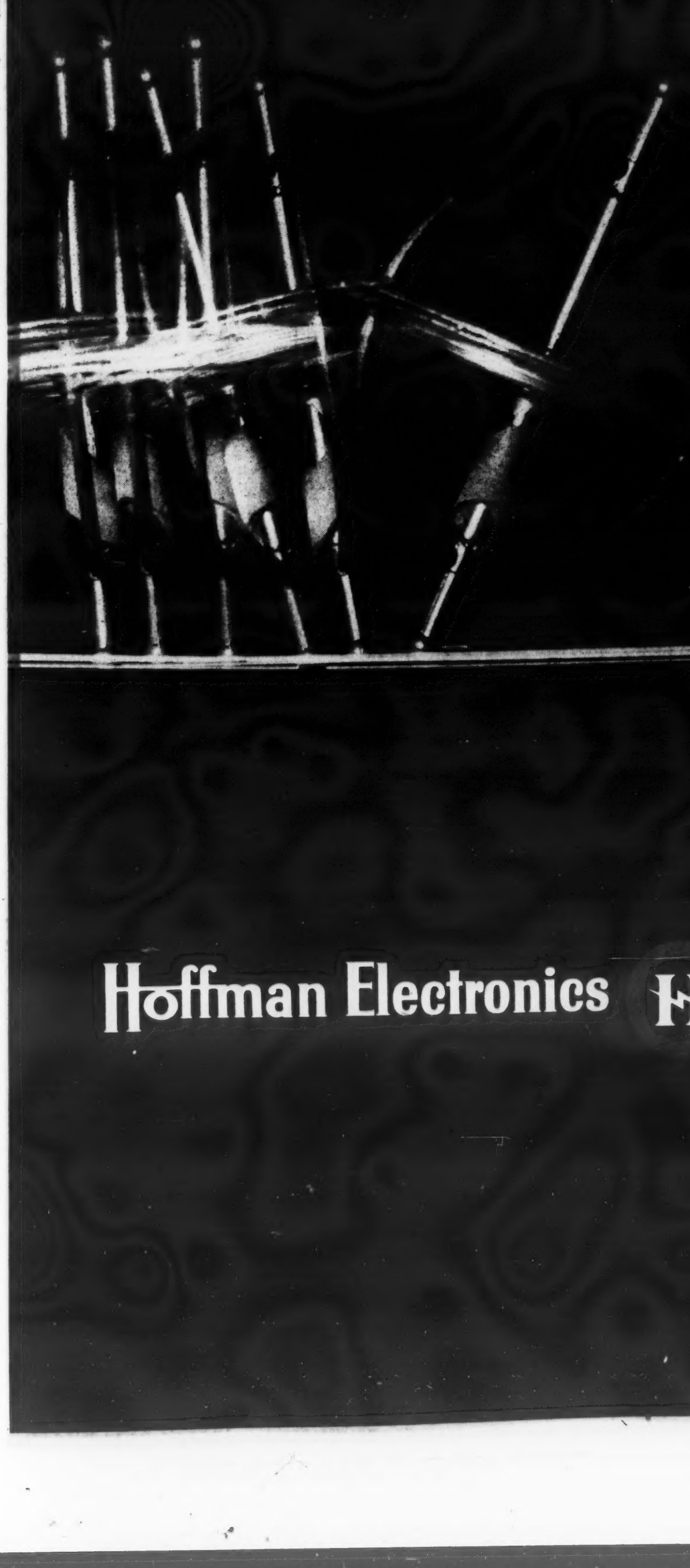

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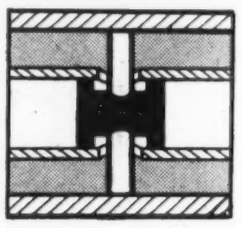

Diagramatic of reactance compensated insulator

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oratory to the contractor's facility, and upon arrival, contact the procuring service and contractor's representatives.

A visual examination of the contractor's proposed suppression system is performed, and when necessary, the system is corrected to conform to the detail requirements of the specification. Radio interference suppression measurements are then performed, and if objectionable interference is noted, the system is improved by the Signal Corps engineers in conjunction with the contractor's project engineer to a degree which will attenuate the interference to the required level and in a manner which will not delay the production of the equipment. If it has been found necessary to revise the proposed suppression system, the contractor is furnished complete information for the procurement of any additional components required.

Radio interference suppression tests are conducted in an area free of man-made interference, as experience has revealed that this is a highly satisfactory method of determining the degree of interference emanating from the equipment under investigation. It is necessary therefore, that the interference measuring equipment, tools, components, power supply, etc., be transported to an interference-free area in the vicinity of the contractor's plant. This is accomplished by the Laboratories at any location in the United States.

To further provide optimum service to the procuring agencies and contractors in the heavily industrialized middle west, USASEL Field Station No. 1 is maintained at Milwaukee, Wisconsin. This station, similar to the group at the Laboratories has complete facilities for the performance of radio interference suppression investigations.

Other services rendered by the Signal Corps to technical procuring services and their contractors include the following:

(a) Discussion of radio interference suppression requirements and outline of basic suppression systems for equipments in the early design stage.

(b) Review and revision, if required, of contractors' drawings of proposed suppression systems for experimental development of pre-production models.

(c) Review of all specifications of potential interference production devices, prepared by the Technical Services, to assure

(*Continued on page* 24)

meeting contract specifications

by Henry Butler
Associate Lab. Director
Federal Telecommunications Labs.

THE BASIC PRINCIPLES OF maintaining good customer relations on a hardware contract are the same as for any other contract, namely, deliver what the contract calls for, on time, and within the original contract price. However, for this type of contract, the fulfillment of the requirements involves procedures and techniques which are almost completely different from those required by an R & D type of contract. For instance, to deliver *satisfactory* hardware (with accessories) *on time,* requires a very definite sequence of operations by a number of cooperating groups, wherein poor performance on the part of one group seriously affects the other groups and the success of the whole project. This factor brings up the extreme importance, in this type of contract, of *scheduling.* Also, to deliver *all* the contract items within the *original contract price* is far from easy where many cooperating groups are involved, and requires quite intricate and rigidly monitored financial control mechanisms.

In handling the problem of delivering *what* the contract calls for, the applicable specifications are a very important factor.

In operating under a Project Manager system, the first step which a Project Manager should take is to carefully read the contract, making an extract of the important points, such as delivery dates and unusual or special requirements which might be too easily forgotten during the hectic processing of the main contract objective. The delivery dates must include *all* dates—not just for equipment, but for reports, manufacturing drawings, instruction books and other literature, etc. Special requirements could include such things as a requirement to obtain contractual approval for subcontracts, large purchase orders and handling of patentable ideas.

From an engineering viewpoint, the most important part of the contract is the main governing specification. This main specification may very discretely cover a well-defined piece of equipment, or it may be a very loose specification for a rather nebulous piece of equipment or a system. However, it usually references a whole series of very detailed and very annoying specifications covering such things as component characteristics, material qualities, drawing format, inspection methods and design restrictions.

The origin and evolution of this complex specification system grew explosively during and subsequent to World War II. With the tremendously augmented need for equipment, and the corresponding need for multiple suppliers, the government agencies attempted to protect themselves by more and more detailed and restrictive specifications.

To satisfy all of the specification requirements—some of which are usually conflicting — necessitates quite a lot of doing of a type which is more or less repugnant to, and outside the experience of, the average R & D engineer. Actually, no equipment of which I have knowledge would ever meet all of this maze of specifications and requirements. However, it is extremely important to have the equipment design directed by a nucleus of supervisory grade engineers with sufficient specialized experience to recognize which specification requirements are important to the particular customer involved, and which requirements may be, or possibly must be, ignored in achieving the objective of providing equipment which satisfies the customer's end use.

For instance, the over-all performance characteristics of the equipment are usually of prime importance, but the various characteristics can usually be weighed in order of importance in terms of the engineer's knowledge of the end use and the whims of the customer's technical representative. In cases where the wording of some of the performance requirements is vague, every effort should be made to sell the customer's representative on an interpretation which will provide good equipment, and at the same time provide the best cost saving. Such interpretations and clarifications should be formally, but diplomatically, recorded in minutes of meetings or other convenient documents.

It probably should be mentioned here that the term "waiver" should, in general, be carefully avoided. The use of the word "waiver" usually implies to the contracting officer a request for a decrease in performance or quality which, in turn, implies a reduction in contract price. Many potentially dangerous parts of a specification which, at first glance, would appear to require a waiver can, with the application of a little ingenuity, be covered by an interpretation or clarification rather than by the dangerous waiver request or cumbersome contract modification. Such action should, of course, be taken very early in a program so that it is obviously foresight.

As work on a project progresses, it is highly important to maintain close contact between the technical personnel of customer and contractor. In the course of this collaboration, it frequently occurs that certain positive specification requirements are found to be mutually unsatisfactory. It is then extremely important that such cases be covered as soon as practical by a formal specification modification. Delay can be disastrous in case of a change in personnel of our customer contract, or if we should inadvertently do something to alienate the affection of the representative whose good will we have been cultivating.

The process of effecting the necessary contract modification can be exasperatingly time-consuming, with the danger of being caught barrelling down the wrong track, contractually, getting greater all the time. The time element can sometimes be greatly reduced by informally furnishing the customer's engineer with a draft of the desired specification modification which he can process without going to the trouble of preparing it himself.

Contract Specifications

Regarding subsidiary specifications for components, materials and construction methods, there are many cases where rigid adherence to the requirements would result in equipment which is more bulky, more expensive, and even less suitable than if experience and common sense are employed. Here, great discretion is required to determine what requirements can be safely ignored and which should be discussed and covered by correspondence.

With respect to electrical components, in particular, it is presently important, with practically all government customers, to obtain written contractual approval to employ each component which does not rigidly comply with some component specification referred to in the contract.

Although keeping the customer's technical representative happy is of prime importance, it is very dangerous to ignore the resident inspector who represents another of the many heads of our composite customer.

Although factory inspection problems are probably quite different from R & D inspection problems, the basic principles are much the same.

In factory production contracts, good relations with the inspection force are best achieved by keeping at least the chief inspector constantly informed of the status of the equipment—inviting him to inspect and criticize models in process, and asking guidance in handling annoying subsidiary specification routines. It should be emphasized that most government specifications are so worded that final acceptance of equipment is at the discretion of the inspector. One cannot asquiesce to all the requests of an inspector, but with diplomacy, and quite a bit of patience, an economical compromise can usually be achieved. If the inspector feels that he has contributed materially to the quality and suitability of the product, things will proceed smoothly. On the other hand, an inspector who has been snubbed can "throw the book" at you and make life very difficult.

In addition to specification requirements which apply to the equipment itself, there are usually numerous, very complex specifications applicable to subsidiary contract items, such as manufacturing drawings, instruction and other literature, spare parts provisioning and procurement and progress reports, to mention a few. In many of these areas, it is impractical to expect the Project Manager to acquire the detailed knowledge necessary to personally guide these activities. It is, therefore, quite essential to the success of the over-all project that the Project Manager have available to him experienced specialized groups which are capable of assuring that contract items of this nature are taken care of in a manner which completely satisfies the customer with regard to quality and promptness of delivery. Here again, to maintain good relations with a few more of the "heads" representing the customer, the criterion is *satisfaction* of the customer and not merely *acceptance* by the customer.

In conclusion, I would say that the assignment of the Project Manager is one of great importance and responsibility. He should, in addition to having reasonable technical competence, be endowed with the persuasiveness of the salesman, the drive of a drill master, the diplomacy of a statesman, and the patience of Job.

Interference (*Continued from page 22*)

that radio interference suppression requirements are adequately described and realistically evaluated.

(d) Performance of radio interference suppression tests and design of suppression systems for electrical assemblies and sub-assemblies.

(e) Distribution of pertinent suppression data, including drawings, specifications, reports, information letters, lists of approved component supplies, etc., to all services and contractors.

(f) Develop general-purpose suppression components and establish sources of supply.

Development Program

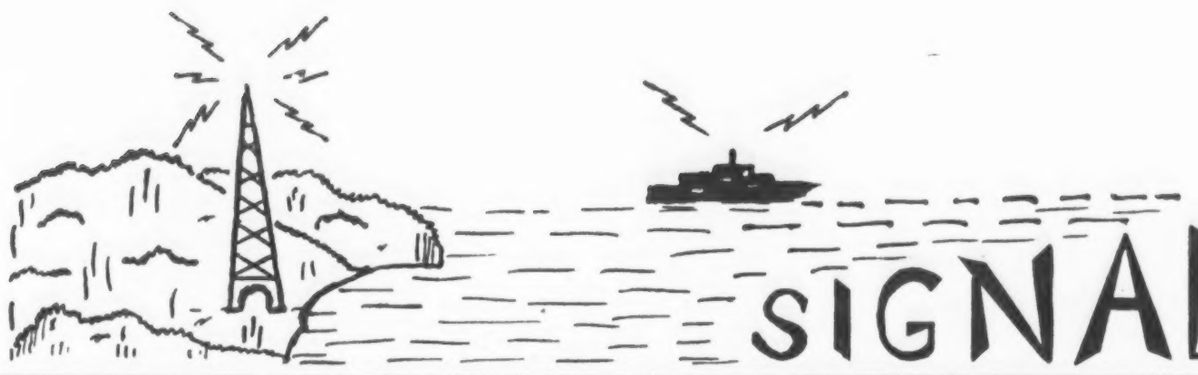
The rendering of the services discussed above is only possible after considerable research and development work has been successfully performed. This work is primarily concerned with the improvement of instrumentation, components and techniques, and in support of Project MONMOUTH.

Great emphasis is now being directed toward preventing the compromise of the operating effectiveness of communications and other electronic equipments and systems through non-intentional interference or self-jamming, and permitting maximum flexibility of equipment and system employment to meet the requirements of new tactical concepts. Investigative studies through contractual actions are being conducted of radar-to-radar and radar-to-communication interference and of spurious emission and response characteristics of transmitters and receivers and the measurement thereof. This portion of the program is in support of Project MONMOUTH (*Efficient Spectrum Utilization*, November 1957 issue of SIGNAL).

The interference radiating from unsuppressed equipments covers a very broad frequency range. The measurement of this interference requires instrumentation which is accurate, stable, consistent, easy to operate and portable. The Signal Laboratories have designed equipments which not only fulfill these requirements but which are considered the ultimate in their field. The development of Radio Interference Measuring Set AN/URM-85 has been recently completed. This equipment will replace existing equipments (AN/URM-3, AN/URM-7, AN/APR-4 modified) and will be capable of measuring field intensity and broad-band interference over the frequency range of 0.15 to 1000.0 megacycles. Development work is also progressing satisfactorily on a conversion unit which will extend the frequency range of this equipment to 4500 megacycles. The development of interference measuring equipment for use by repair echelons is also progressing satisfactorily.

In addition, existing measurement standards are being improved; interference reduction techniques required above 1000.0 megacycles are being evolved; components incorporating improved reliability, effectiveness, size and economy features are under development, and research on basic electromagnetic interference phenomena is being continued.

The design and development of ever-increasing numbers and types of electronic equipments will increase the necessity for major emphasis on adequate interference reduction. The Army Signal Laboratories through its contractual and internal programs will continue to make every effort to assure that interference-free communications are maintained in the Theaters of Operation, and that the Army Technical Services are furnished optimum assistance in the solution of their interference reduction problems.



SIGNAL·GRAM

— GOVERNMENT —

SATELLITE FOR RELAY STATION The Air Force is studying a proposal for a satellite that would hover, 20,000 miles up, over a fixed point in earth according to Lt. Gen. C. S. Irvine, Air Force Deputy Chief of Staff, Materiel. Immediate applications would be reconnaissance and "counter measures against communications." Service experts said it would be "wonderful" as a radio-TV relay station, and for weather observation, as well.

AIR CONDITIONING AT THE ARCTIC According to Carrier Corporation, which supplied refrigerating equipment for the air conditioning system of the atomic-powered submarine USS NAUTILUS, the problems encountered in undersea craft are reported to be similar to those that confront us in outer space. In August, the Navy is planning to renew Arctic operations begun by the USS NAUTILUS last spring. Two nuclear-powered submarines and one conventional submarine will participate in this Arctic cruise to further the collection of little known hydrographic and scientific information in the Arctic area.

SCATTER COMMUNICATIONS. The Air Force will expand its scatter communications systems about 50% during the next two years. According to Maj. Gen. A. D. Pachynski, Air Force Director of Communications, the bulk of the approximately 8,000 miles of tropospheric and ionospheric scatter communications will be added in the Arctic and subarctic, connecting the North American continent. Presently, the Air Force has about 8,500 route miles of tropospheric scatter systems and about 8,700 miles of ionospheric scatter systems, including White Alice installations in Alaska.

MISSILE BILL The President has signed a $1.4 billion fiscal 1958 appropriation bill to speed up missiles and air defense programs. The bill includes $910 million for the Air Force, $350 million for the Navy and $40 million (by transfer from other accounts) for the Army. Also, there is $10 million for the new Advanced Research Projects Agency and $100 million for the Secretary of Defense's emergency fund (standby money that can be put quickly into any program that is ready for further acceleration).

EXPLORER III The failure of Explorer II's attempt to orbit did not deter engineers and scientists at Jet Propulsion Laboratory in Pasadena, California. This laboratory had the same duties in designing and building Explorer III as it had for the two previous earth satellites. Explorer II differed from Explorer I in that it contained a miniature magnetic tape recorder, developed by the University of Iowa and adapted for use at Jet Propulsion Laboratory.

NEW DEPARTMENT OF DEFENSE POLICY To increase assistance to small business concerns and labor surplus areas, a new clause is being inserted in future Service contracts urging prime contractors to give preference in subcontracting to contractors in labor surplus areas if the subcontractors are qualified and no price increase will result. Preference in such subcontracting will be first to small concerns in labor surplus areas; second, other business in labor surplus areas, and third, small business firms not in labor surplus areas.

CONTRACTS: ARMY: Aircraft Radio Corp., radio sets—$2,024,483, and receivers—$1,231,296; Western Electric Co., work on Nike-Hercules, $3,401,354; Telecomputing Corp., nuclear warhead test equipment, $1,845,000; Aeronutronic Systems, Inc., 12 months research in missile range instrumentation field, $182,355. NAVY: Times Facsimile Corp., radiationless continuous page facsimile recorder, $135,558; Raytheon Manufacturing Co., shipboard radio sets, $10,983,505; Westinghouse Electric Corp., designing and furnishing reactor compartment components for 3 nuclear-powered Fleet ballistic missile submarines, $18,630,000; General Electric Co., construction of propulsion machinery for 3 nuclear-powered Fleet ballistic missile submarines, $6,360,341. AIR FORCE: Collins Radio Co., airborne high frequency systems, $10,500,000; Sperry Gyroscope Co., development, production and system manager of a new radar program, $21,000,000; Crosley Division of Avco Mfg. Corp., Closed-circuit television equipment, $1,000,000; Hallamore Electronics Co., branching amplifiers, spare parts and test equipment for "Project Globecom" (communication system for linking together USAF air bases throughout the world), $787,250.

— INDUSTRY —

WESTERN UNION EXPANSION A new microwave radio beam system will go into operation shortly between Pittsburgh, Cincinnati and Chicago, extending the present beam system from New York to the Midwest. Western Union reported that "tower sites are being acquired for additional routes that will reach other important cities, including Toledo, Detroit, Cleveland, Indianapolis, St. Louis and Kansas City."

U.S. FIRM BIDS ASKED FOR GREEK TV STATION Greece is requesting bids for the supply, erection, and putting into operation of a complete television station. Bids for this estimated $240,000 project should be submitted by May 6 to the Greek National Broadcasting Institute, Supply Service, 7 P.P. Germanov Street, Athens. For additional information contact the Greek Foreign Trade Administration, 1028 Connecticut Avenue, Washington, D.C.

TRANSISTORIZED AIRBORNE DOPPLER NAVIGATION SYSTEM The Collins Radio Company has officially announced that it is currently developing a transistorized airborne doppler navigation system for airline use. Company spokesmen anticipate flying prototypes in Collins aircraft by late 1958 and models for airline evaluation by early 1959.

MOBILE RADIO NETWORKS In Philadelphia, RCA Communications Products department is installing a $600,000 radio network for police communications, comprising UHF mobile radios for police vehicles and 16 remotely-operated base stations. A microwave relay system will remotely control the base stations. Recently, RCA completed installation of a mobile communication network at the Dime Savings Bank of Brooklyn —one of the first banks to use two-way radio. To control the activities of its field appraisers, the bank linked its 29 autos to two base stations.

TELEPHONE CABLE BETWEEN U.S. AND PUERTO RICO The Long Lines Department of AT&T and IT&T are planning to construct a direct submarine telephone cable system between continental United States and Puerto Rico to facilitate the telephone traffic that has more than doubled during the past five years. The estimated $17,000,000 cost will be shared equally by Radio Corp. of Puerto Rico, a subsidiary of IT&T, and by Long Lines. The existing radio systems used for telephone service at present will be supplemented by the new cable system.

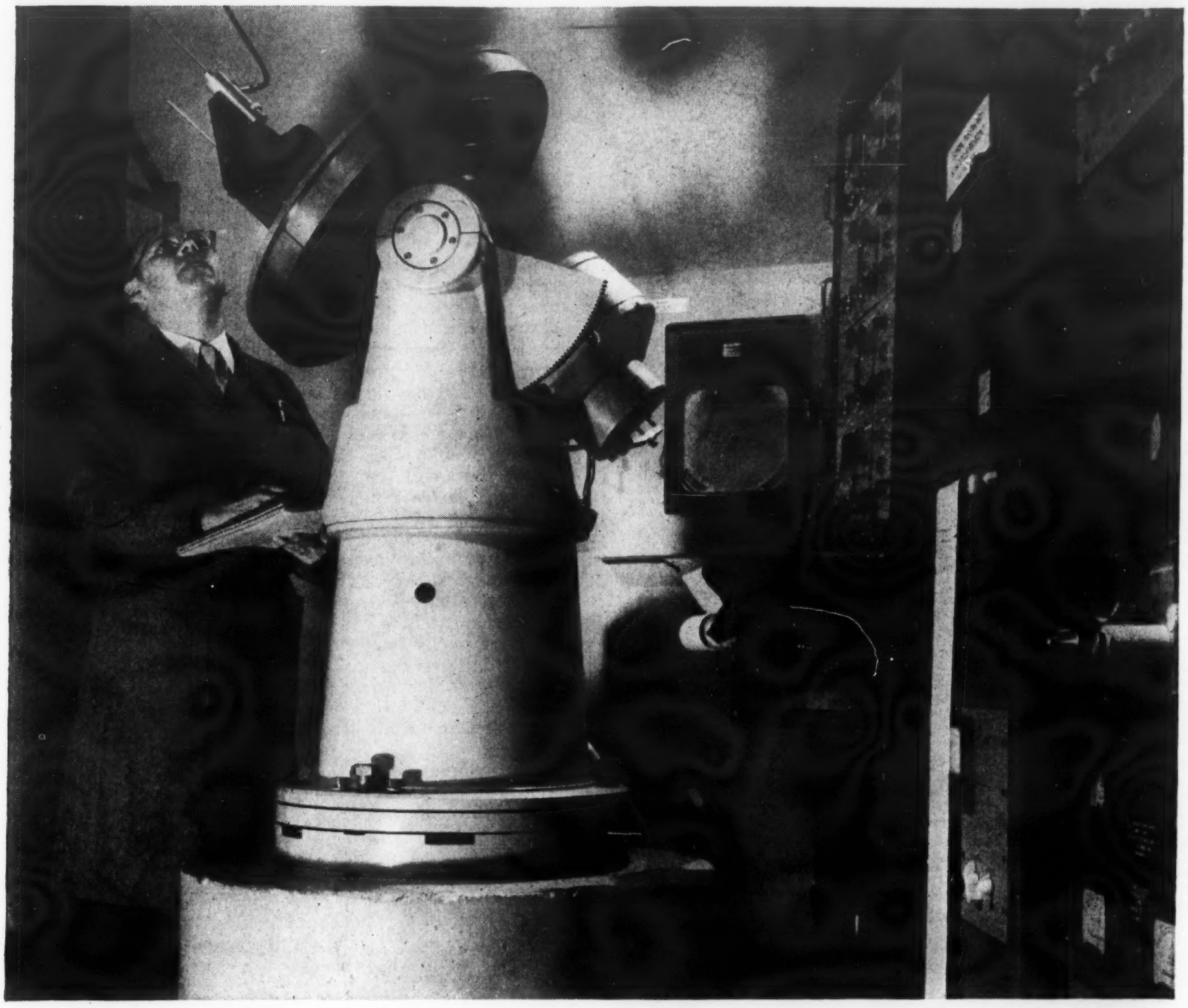
AVCO OFFERS RADAR RANGE CALCULATOR A radar self-screening range calculator that provides a jamming figure of merit for radar system engineers has been designed by Avco. The hand calculator with its simplified scale settings is said to eliminate slide rule calculations formerly required to determine the distance at which signal energy received at the radar is large enough to show through the jamming noise. Copies may be obtained by radar engineers through request on company letterhead to James McHugh, director of publications, Electronics Research Laboratoratory, Avco's Research and Advanced Development Division, 750 Commonwealth Avenue, Boston, Massachusetts.

— GENERAL —

ANTIQUE CAMERAS WANTED If you have a camera that's more than 25 years old and is a real curio item, you can get a brand new Praktina or Praktica camera in exchange for it, from Standard Camera Corp. Standard is creating a collection of old and historical cameras for display in its showrooms and for loan to museums, schools and public institutions. Send a photograph of your camera along with a description and a history, if available, to: Old Camera Collection, Standard Camera Corporation, 319 Fifth Avenue, New York 16, N.Y.

MAY 17 IS ARMED FORCES DAY "Power for Peace" is the slogan of the day on which the public is invited to take a close look at our national defense system. Principal emphasis will be placed on the relationship between our national strength and our peaceful aspirations. A feature of the observance will be "open house" programs and community projects at military installations in the United States and overseas.

CONVENTION CALENDAR:
May 6-8: Western Joint Computer Conference, Ambassador Hotel, Los Angeles, California. Sponsored by PGEC, AIEE, ACM.
May 12-14: National Conference on Aeronautical Electronics, Dayton Biltmore Hotel, Dayton, Ohio. Sponsored by IRE and PGANE.
May 13-15: Spring Assembly Meeting of the Radio Technical Commission for Marine Services, Benjamin Franklin Hotel, Philadelphia, Pennsylvania.
June 4-6: Armed Forces Communications and Electronics Association's Twelfth Annual Convention and Exhibit, Sheraton Park Hotel, Washington, D.C.



Ford Instrument Co. Engineer checks air-bearing gyro for angular drift on equatorial test stand. Test can show up drift rates as low as one revolution in 40 years. Tests like this . . .

helped Army put "Explorer" into orbit

Some of Ford Instrument's current or recent programs include:

Inertial guidance systems . . . including Redstone and Jupiter

Missile launching and control order computers

Navigational and mission control systems and computers

Analog and digital computer systems

Fuzing, arming and other warhead control equipment

Plotting equipment

Nuclear systems and controls

Gunfire controls

Drone controls

A special guidance system for the Jupiter C, developed by the Army Ballistic Missile Agency, was used to launch the first U. S. artificial satellite into space.

Many components of this system were provided by Ford Instrument Co., prime contractor for both the "standard" U. S. Army Redstone and Jupiter guidance systems.

The fabulously-equipped, fantastically-clean gyro lab (above) is only a small part of the advanced research and development facilities available at Ford Instrument Co. They're used to create and produce the incredibly accurate control systems called for by modern technology in both government and industry.

And Ford Instrument's large-scale precision manufacturing facilities can turn even the most critical system requirements into working "hardware" on a quantity-production basis. Our Liaison Engineers are at your service to discuss your system requirements. 8.6

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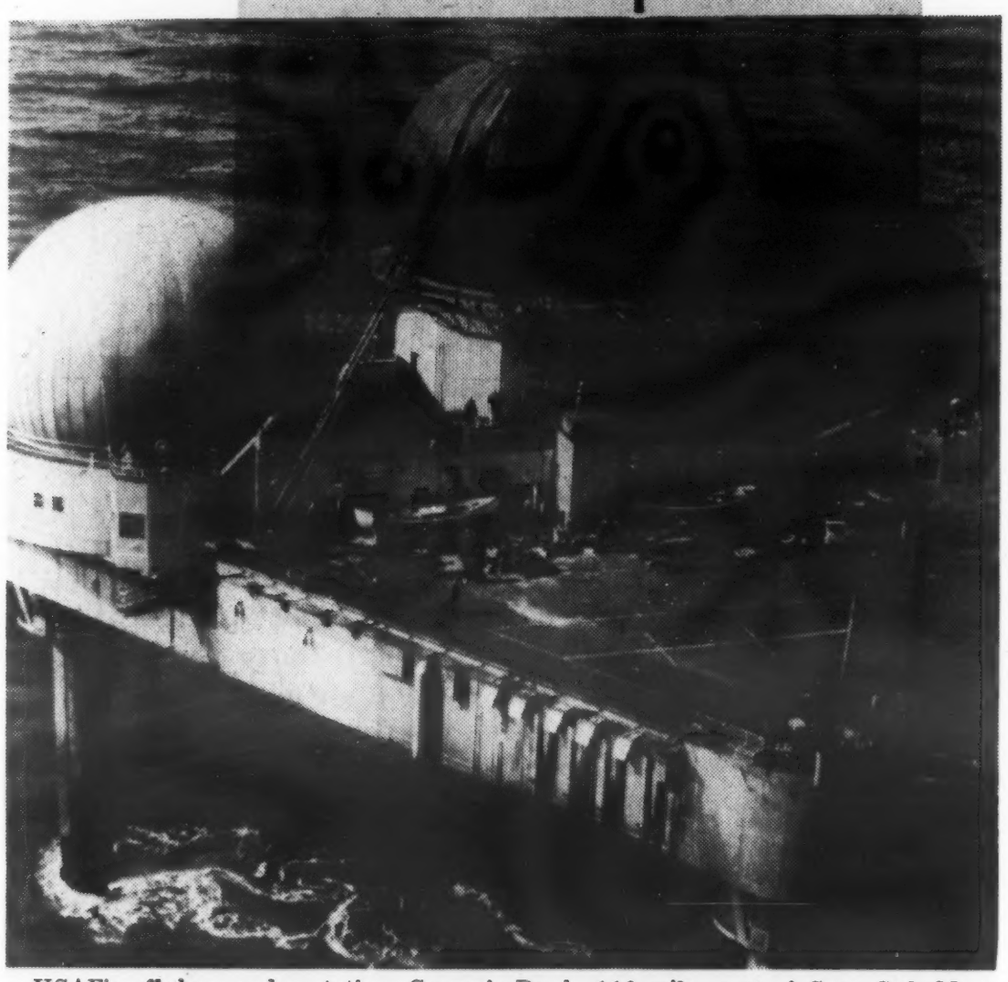
the Air Force views over the horizon techniques



USAF's off-shore radar station, George's Bank, 110 miles east of Cape Cod, Mass.

by Maj. Gen. Alvin L. Pachynski, USAF
Dir., Communications-Electronics, USAF

An address to a distinguished audience at our London Chapter

As the First Vice President of the Armed Forces Communications and Electronics Association, I always find it a real pleasure to be able to visit the various chapters of the Association and to help in promoting the purposes of this worthy organization.

We in the Association are particularly proud of our chapters overseas, such as this one in London. They serve to bring together, because of a common bond of interest in fostering the advancement of military communications-electronics, personnel of the United States and its allies, military and civilian, and representatives of both government and industry. Such a voluntary association cannot help but result in a better mutual understanding of the variety of problems which increasingly beset us in an age of growing technological complexity.

As new weapons are developed and enter the military inventory we find growing demands to provide the communications-electronics means essential to operate these weapons effectively. Time and space are being annihilated and as a result speed and reliability required for control and direction of these weapons become constantly more important factors in the design of the communications-electronics means required. To meet these demands, we find it necessary to adopt (perhaps pioneer would be a better word) any and all available techniques which definitely show promise of a significant improvement over existing means. This applies to communications as well as to other areas within the communications-electronics field.

Approximately five years ago, the United States Air Force became actively interested in experimental work being conducted in "over-the-horizon" techniques of communications. Our interest was sparked primarily by the fact that we were confronted with problems of providing more adequate and reliable communications in the Arctic and the North Atlantic. My discussion will be devoted to why and how we have applied these new "over-the-horizon" or "scatter" techniques to our military needs and to our operational experience with them since 1953.

Before going into detail on the systems I am going to discuss, perhaps an operational definition of the two scatter techniques will orient our thinking. Ionospheric scatter is a method of providing teletype circuits over distances from six-hundred to twelve-hundred miles. Tropospheric scatter is a method of providing multi-channel voice and teletype over distances from just beyond the line-of-sight up to somewhat beyond six-hundred miles. In terms of distance the two modes compliment each other.

We have always been faced with the problem of providing reliable communications in the northern latitudes. Low frequency and high frequency radio are subject to periodic and extended outages caused by auroral disturbances. The geographical configuration and distances involved in these areas prohibit the use of cable or wire facilities. Microwave facilities are almost as difficult to provide. The advent of scatter provided us the transmission techniques needed to obtain reliable circuits over the distances involved.

Today the United States Air Force has in operation approximately 8,500 route miles of tropospheric scatter circuits and 8,700 route miles of ionospheric circuits. This represents a total investment to the Air Force of approximately $234,000,000. We have projected for installation in the next two years approximately 8,000 additional route miles of tropospheric and ionospheric circuits. The bulk of these facilities are or will be installed in the Arctic and subarctic regions, principally on and connecting to the North American continent. The constantly increasing scope of this complex of communications is indicative of the degree of our confidence in these two new techniques of communications which either compliment each other in operation or are used to provide transmission media for different modulation modes.

Now I would like to look back to 1953 again. At Thule, Greenland, we had established a SAC base. We also had operating facilities at Sondrestrom, Greenland, at Goose Bay, Labrador, and at Loring Air Force Base in the state of Maine. To provide communications between these bases we had conventional multi-channel high frequency circuits supplemented by low frequency facilities. The latter provided

only a limited traffic capacity. The needs of air operations between these bases were such as to require highly reliable, dependable communications at all times possessing adequate traffic handling capacity. Due to auroral conditions, blackouts of our high frequency communications were frequently experienced, a situation which was intolerable from the standpoint of SAC operational requirements. Upon the advice of our scientist friends we jumped at the opportunity to provide what was recommended to us as a better means of communications for this area, namely forward propagation ionospheric scatter. The first ionospheric scatter circuits installed by us provided four teletype channels from Loring Air Force Base, Maine, to Thule, Greenland. Subsequently, we expanded these circuits to eight teletype channels. We are now in the process of installing multiplex equipment which will give us sixteen teletype channels over this route. We have also provided modifications which we hope ultimately will give us a voice channel in lieu of four of the teletype channels in this system.

The results obtained from this system were so gratifying that we decided to extend the system to Iceland and the United Kingdom. This extension is operating and providing four teletype channels. The reliability of the entire system from the United Kingdom to the United States greatly exceeds that which we experienced on low or high frequency radio.

As with any new technique, operational experience leads to modification and improvements. For example, the reliability of the Loring Air Force Base to Goose Air Base path was not as good as the other paths. This path was less than 500 miles in length and the ionospheric scatter technique would not work satisfactorily over this short path. We moved the terminal to Massachusetts, thus lengthening the path and obtaining increased reliability.

The equipment used on this system consists of 40 kw power amplifiers operating in the frequency range of thirty to forty megacycles. The receivers are frequency shift keyer type. The multiplex equipment employs the time division principle. Various types of antennas such as rhombic, yaggi and corner reflectors are used.

In 1953 we also initiated the installation of the first operational tropospheric scatter system which extends from St. Johns, Newfoundland, to Frobisher Bay, Baffin Island. This system was installed to provide communications for a chain of radar stations along the northeast coast of the North American Continent. We consider this system to be the granddaddy of all tropospheric scatter systems. The experience gained from this system has contributed greatly to the further development of the art for both military and commercial tropospheric scatter systems. The decision to install this system was based solely on the factors of reliability, cost and channel capacity. We recognized that low or high frequency radio would not provide the channel capacity or the reliability required for this chain of radars. A conventional line-of-sight microwave system consisting of approximately fifty stations, the majority of which were located on isolated mountain tops, in rugged Arctic terrain, was first planned. This system was estimated to cost $40,000,000. About this time, the initial results of tropospheric propagation tests were made known. After consultation with the Bell Telephone Laboratories and the Lincoln Laboratory of the Massachusetts Institute of Technology, it was decided to implement a test circuit in the Newfoundland area to evaluate the possibility of employing this mode. Even before the test was completed, such satisfactory results were obtained that it was decided to go ahead with a complete installation of this new system and to eliminate the microwave system. This decision resulted in a savings of approximately $20,000,000 to the Air Force. Now instead of a system consisting of fifty stations, we had a system of only ten stations and they were co-located with the radars.

The system is 1,427 miles in length with one spur section of 182 miles. Initial engineering of this system provided 24 voice frequency channels of which one was multiplexed to give twelve teletype circuits. Later requirements made it necessary to expand the system to 36 voice channels of which two were multiplexed to give twenty-four teletype circuits. The shortest hop in the system is 130 miles. The longest hop is 228 miles.

The equipment used to implement this system was of a type commercially available at that time. Ten kilowatt ultra high frequency power amplifiers, operating in the frequency of 571 to 731 megacycles, with sixty-foot parabolic antennas are the main stay of the system. Of course, associated with this are receivers with the capability of reaching down into the mud, so to speak, to pick up the signal. The voice multiplex equipment was manufactured by the General Electric Company, Limited, of England. The voice frequency carrier telegraph equipment was manufactured by Standard Telephones and Cables, Limited, of England.

This being the first operational tropospheric scatter system, a lot was learned about the engineering and equipment configuration for future systems. For example, we had no problems with the voice circuits. However, teletype messages were subject to "Hite" and "Garbles." We found that the type of diversity being employed, which was the "Switch" type, was introducing transients into the circuits. We corrected this by installing diversity combiners operating on the principle of combining the baseband. The initial telegraph multiplex equipment did not perform too satisfactorily. This equipment operated on a "Tone On" "Tone Off" principle. We later replaced this equipment with a type employing the frequency shift technique which further improved the teletype operation.

During the year from September, 1956 to August, 1957, the circuit reliability based on all reported outages was: for voice circuits, 99.1 percent; for teletype circuits, 91.1 percent. For the same period, the circuit reliability based only on the tropospheric scatter equipment outages was: voice circuits, 99.8 percent; for teletype circuits, 95 percent.

Some of the equipment and antennas used include: 60 foot antennas, 10 kw power amplifiers, klystrons, channelizing equipment, receivers and exciters.

In Alaska, we are installing a communications system consisting of 23 tropospheric scatter links and eight microwave links. Although the initial requirement for this system was to provide circuits for air defense purposes, other users along the paths are being served. The entire system consists of 3000 route miles. The number of voice channels in each link varies from 24 to 132. There is a total of 170,000 telephone channel miles and 50,000 telegraph miles.

The circuits in this system were engineered on the same basis as would be used in engineering long-haul circuits in a commercial communications system. The over-all objective for median noise on a trunk is 38 dba at the O transmission level. This represents the noise from all sources, observed at the terminal of a long circuit, which may be exceeded fifty percent of the time. The 38 dba objective is for a multilink circuit of several thousand miles. Each radio link was engineered to provide better performance than this objective, so that when many are connected to form a long circuit, the objective will be met. In addition, the system was engineered so that noise peaks would exceed 49 dba only a small percentage of time.

The shortest link in the system is 68.7 miles and the longest link is 168.2 miles. One and ten kilowatt Uhf amplifiers and both 30- and 60-foot antennas are used in the system.

Although this system is not completely installed, initial tests on links that are operating indicate the design objective has been met. The over-all system reliability expected to be achieved approaches 100 percent. Some of the equipment in the system includes: 60-foot and 30-foot antennas, power amplifiers and receivers.

Distant Early Warning Line

We are using tropospheric scatter links to provide communications for the chain of radar stations known as the Distant Early Warning Line. These stations are located north of the Arctic Circle. The western end of this system ties into the Alaskan system and the eastern end ties into the first system previously discussed. At various locations along the line, ionospheric scatter links are used to tie into commercial facilities to the south. The decision to use the scatter techniques was based on the geographical area, channel capacity and reliability. Since tropospheric scatter terminals could be co-located with the radars, the need for repeater stations in this remote area is eliminated.

The system consists of 24 voice frequency channels of which one channel is multiplexed to provide 12 teletype channels. Both one- and ten-kilowatt power amplifiers operating in the frequency range of 755 to 985 Mc are used. Thirty- and sixty-foot antennas are employed in a dual space diversity configuration.

To provide communications over a 120-mile path, between a radar station on a so-called Texas tower located off-shore from Massachusetts, and a shore terminal, we are using a tropospheric scatter link. This system employs ten-kilowatt power amplifiers and triple diversity using thirty-foot antennas. Frequency division multiplex equipment is used providing seventy-two voice or data channels.

During the first year of operation a long term system reliability of 99.98% was achieved. For the 8,760 hours in the 12-month period there were only two hours and fifteen minutes of outage time caused by equipment failure.

Performance of this nature justified the use of tropospheric scatter where multi-channel voice and high reliability is a requirement.

Spain - North Africa System

A system we have operating a little closer to your shores is the one between Sevilla, Spain and Sidi Slimane, North Africa. This system was installed to meet a SAC operational requirement. It consists of twelve voice frequency channels of which two are multiplexed to provide 24 teletype channels. Ten-kilowatt power amplifiers and sixty-foot antennas are used in this system. The reliability of this link exceeds 99%.

Long Range Tropo Studies

Recently we were apprised of the initial results of long range tropospheric propagation studies. We immediately looked at the possibility of applying such a long range system to a 690-mile path requirement in the Arctic. A path loss test was conducted over the route and the results supported the theoretical calculations. We decided to install this system as soon as tests of a similar system in the States demonstrated its feasibility. We presently have the test system operating over a 640-mile path.

The equipment used for long range tropospheric scatter consists of 20-kilowatt power amplifiers operating in the frequency range of 350 to 450 Mcs. 120-foot antennas and quadruple diversity are used. This equipment employs the single sideband modulation technique which gives considerable advantage over FM. The system will provide 24 voice frequency channels of which two will be multiplexed to provide 24 teletype channels. The expected reliability of this system exceeds 99%.

Some of the test circuit equipment includes: 120-foot antennas, building housing equipment, duplexers, power amplifiers and operating consoles.

The systems I have described represent a significant capital investment which we feel has been fully justified by the results obtained. We do not claim that the scatter techniques constitute a panacea for all of our communications ills. In some respects they have their limitations. But they are a big step forward in providing media for transmission of intelligence under conditions of propagation and physical environment, or both, where other means are less reliable, more costly or even impossible to provide. The decision to employ the scatter techniques versus other methods must necessarily be made after weighing a number of factors. These include: channel capacity required; type of modulation such as voice, data, or teletype; reliability; distances involved; geographical environment; site availability and accessibility, and last but not least, *cost.* We have installed scatter circuits only after having given due consideration to all of these.

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[The many professional papers submitted are now being considered by the Committee. The subjects of the papers selected will be announced in the May issue of SIGNAL.]

WEDNESDAY
Presidents' Meeting, 9:00 a.m.
Keynote Luncheon, 12:30 p.m.
Panel Discussion, 2:00 p.m.
Reception, 6:30 p.m.
Buffet supper, 7:45 p.m.

THURSDAY
Council and Directors' meeting, 9:00 a.m.
Tour with Luncheon — Andrews Air Force Base, 11:30 a.m.
Reception, 6:30 p.m.
Banquet, 7:45 p.m.

FRIDAY
Industrial Luncheon, 12:30 p.m.

Ladies' Activities, Luncheons & Banquet speakers to be announced later.

▶ Show Hours: Wed.-Thurs. 11 am-7 pm, . Fri. 11 am-5 pm

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Communications—Electronics—Photography

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ATLANTA: Pres. — Lt. Col. Donald L. Adams, Hqs. Third Army, Fort McPherson, Ga. Sec.—A. M. Wilson; Southern Bell T&T Co., 51 Ivy Street, N.E.

AUGUSTA-FORT GORDON: Pres. James M. Williams, So. Bell Tel. & Tel. Co. 937 Greene St., Augusta, Ga. Sec.—Jack R. Young, So. Bell Tel. & Tel Co., 1570 Sunset Ave., Augusta, Ga.

BALTIMORE: Pres.—Henry B. Yarbrough, Bendix Radio, E. Joppa Rd., Towson, Md. Sec.—Trevor H. Clark, Westinghouse Electric Corp., Air Arm Div., Friendship Int'l. Airport.

BOSTON: Pres. — Col. Murray D. Harris, PMST, Northeastern University, Boston. Sec.—Louis J. Dunham, Jr., Franklin Technical Institute, 41 Berkeley St., Boston, Mass.

CENTRAL FLORIDA: Pres.—Willard L. Moor, 3002 Fair Oaks, Tampa. Sec.—Russell R. Randell, 208 So. Manhattan Ave., Tampa, Fla.

CHICAGO: Pres.—Henry J. McDonald, Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago 38. Sec.—James F. Weldon, SigC Supply Agency; 615 W. Van Buren St.

DAYTON-WRIGHT: Pres. — Col. S. A. Mundell, ARDC, Wright-Patterson AFB, Ohio. Sec.—Jack G. Anderson, Hoffman Laboratories, Inc., 2600 Far Hills Bldg., Dayton.

DECATUR: Pres.—Lt. Col. N. S. Munson, Decatur Signal Depot, Decatur, Ill. Sec.—Fred H. Zickuhr, Decatur Signal Depot, Decatur.

FORT MONMOUTH: Pres.—Halsey F. Hubbard, USAESA, Fort Monmouth, N. J. Sec.—Harry C. Ross, Box 249, Hillside Rd., Atlantic Highlands, N. J.

FRANKFURT: Pres.—Col. W. L. Martin, SigO, Hq. V Corps, APO 79, N. Y. Sec.—Capt. Howard W. Killam, Co. A, 102d Sig Bn, APO 757, N. Y.

GULF COAST: Pres. — Ancil Z. Arseneau, 1350 Park Court So., Biloxi, Miss. Sec.—Joseph A. O'Connell, Southern Bell T&T Co., Gulfport, Miss.

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KANSAS CITY: Pres. — Lt. Col. G. D. Meserve, USAF (Ret.), 6211 W. 55th St., Mission, Kans. Sec.—Maxwell H. Tyrrell, Southwestern Bell Tel. Co., 6500 Troost, Kansas City, Mo.

KOREAN: Pres.—Col. Walter E. Lotz, SigC, 8th Army, APO 301, S. F. Sec.—Wendell B. Carman, Hqs. KMAG, 8202d AU, APO 102, S. F.

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LONDON: Pres.—Lt. Col. John T. Tyler, Hq. Third AF, APO 125, N. Y. Sec.—Capt. H. W. Gipple, Hq. Third AF, APO 125, N. Y.

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NEW YORK: Pres. Col. Ludwig R. Engler, RCA Communications, Inc., 66 Broad St., New York 4, N. Y. Sec.—Thomas Brown IV, New York Telephone Co., Rm. 2011, 140 West St., New York 7, N. Y.

NEW YORK UNIVERSITY: Pres.—Robert A. Fisch, 2386 Davidson Ave., New York 68, N. Y. Sec.—Sheldon Brown, 587 Beck St., New York 55, N. Y .

NORTH CAROLINA: Pres. — James R. Fowler, Carolina T&T Co., 122 E. St. James St., Tarboro. Sec.—John C. Coley, Carolina T&T Co., 517 Hay St., Fayetteville.

NORTH TEXAS: Pres.—H. J. Wissemann, Texas Instruments, 6000 Lemmon Ave., Dallas. Sec.—John W. Williams, 4913 Cockrell Ave., Fort Worth.

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PARIS: Pres.—Br. Gen. Frank W. Moorman, U. S. Army Attache France, APO 230, N.Y. Sec.—Lt. Col. Russell A. Duke, Office of U.S. Army Attache, APO 230, N. Y.

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PHILIPPINE: Pres.—Col. Orville Laird, Hq. Thirteenth AF, APO 74, S. F. Sec.—Robert C. Young, Radio Electronic Hqs., Inc., P.O. Box 1400, Manila.

PITTSBURGH: Pres. — George H. Aderhold, Saxonburg Ceramics Co., Saxonburg, Pa. Sec.—H. W. Shepard, Jr., 386 Arden Road.

ROCKY MOUNTAIN: Pres.—Col. O. W. Miller, USAF Hq. ADC, Ent AFB, Colo., Sec.—Maj. B. C. DeLosier, USAF, Box 4, HQ. ADC, Ent AFB, Colo.

ROME-UTICA: Pres.—Allan A. Kunze, Lee Center, N. Y. Sec.—Darrell S. Kirby, 904 Floyd Ave., Rome, N. Y.

SACRAMENTO: Pres.—Lt. Col. Clarence M. Godfrey, Sacramento Signal Depot. Sec.—Capt. Robert McMorrow, 951 La Sierra Drive.

SAN FRANCISCO: Pres.—Thomas D. Razovich, Don Lee Broadcasting System, 1000 Van Ness Ave., San Francisco. Sec.—Carroll V. N. Steffen, Pacific T&T Co., 74 New Montgomery St., S. F.

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SOUTH TEXAS: Pres.—Col. Will D. Joslin, SigSec, Hq. 4th U. S. Army, Fort Sam Houston, Tex. Sec.—Maj. Vincent Grzegorowicz, 634 Infantry Post, Fort Sam Houston, Tex.

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SOUTHERN CONNECTICUT: Pres. — Edwin B. Hurley, So. New England Tel. Co., Box 1562, New Haven. Sec.—J. A. Leopold, Dictaphone Corp., 375 Howard Ave., Bridgeport.

SWITZERLAND: Pres.—Capt. Gerald C. Gross, USNR, Intl. Telecommunications Union, Geneva. Sec.—Robert V. Lindsey, Intl. Telecommunications Union, Geneva.

TINKER-OKLAHOMA CITY: Pres. — Delbert F. Cravens, Southwestern Bell Tel. Co., 405 No. Broadway, Oklahoma City. Sec.—Lt. Col. Albert A. Rudd, 1800 AACS Wing, Tinker AFB, Okla.

TOKYO: Pres.—Col. Thomas W. Riley, Hq. USARJ Sig. Off., APO 343, S. F. Sec.—D. A. L. Hughes (Philco), Hq. USARJ Sig. Off., APO 343, S. F.

WASHINGTON: Pres.—L. Harriss Robinson, Motorola, Inc., 1145 19th St., N.W. Sec.—John R. O'Brien, Hoffman Laboratories, Inc., 1625 Eye St., N.W.

Chapter News

Arizona

Professor Ned Wilde of the University of Arizona was featured as guest speaker at the February 18th meeting. His subject was "Atomic Field Instrumentation."

The dinner-meeting was held at the USAEPG Officer's Mess, Fort Huachuca, and was preceded by a social hour.

Augusta-Fort Gordon

A program on "Nuclear Power" was presented at the February 20th meeting by Dr. Dessaurer of DuPont. The speaker was introduced by Col. Clarence Dunlap, TSESS.

The usual social hour and dinner preceded the meeting, with the various guests introduced to the chapter members.

During the business session, Carl Rodgers, TSESS, was named acting treasurer to serve during the absence of Col. Darce Knight on a temporary duty assignment, and Ewell Lynch, Southern Bell Tel. & Tel., was appointed to relieve Colonel Knight as chairman of the special award committee.

Chicago

Asserting that the United States and other free nations are not deficient in scientific manpower and engineering talent, George T. Scharffenberger, President of Kellogg Switchboard & Supply Co., told 300 members of the Chicago Chapter on January 30th that the country was on the way to reclaiming the world leadership it held before the Russian launching of the first Sputnik.

"The solutions we need must be forged by the familiar process—in the legislative halls, in our military commands, in the press, and in the final analysis by an aroused and informed public," Scharffenberger said at the dinner-meeting held at Kellogg's electronic plant at 6000 West 51st Street. "It is very evident that these processes are working yeastily and that some progress is being made."

The head of the IT&T affiliate credits the combination of private industry, schools and the government for giving optimism to this Nation's efforts to catch up and pass the Russians.

As manifestation of private industry's contributions he said that International Telephone & Telegraph Corp., of which Kellogg is a division, has 3,000 top scientists, engineers and technicians in its central laboratories in the United States, Germany, France and England as well as in its plants located in 20 countries. "Since 1946, IT&T research has been financed by a 3 per cent contribution from each of its divisions' and subsidiaries' sales to a central reserve for specific appropriations for research and development," Scharffenberger pointed out. "The sum of these contributions amounted to $12,000,000 in 1956 and exceeded $14,000,000 in 1957." "And for the second successive year, $100,000 has been approved to institutes of higher learning for scholarships, fellowships and special grants during the 1958-59 school year." Of the 26 recipient schools, six are in the middle west. They are Ohio State, Illinois Institute of Technology, Purdue, Illinois, Notre Dame and Washington University (St. Louis).

Chicago—The January meeting was held at the Kellogg Switchboard & Supply Company's electronic plant. Shown from left to right are: George T. Scharffenberger, President of Kellogg; Dr. D. A. Swanson, Chief Consultant to the Air Force on Guided Missile matters, principal speaker, and Thomas P. Leddy, Vice President and Director of Government Relations of Kellogg.

Admitting that the challenge is still before the free world, Scharffenberger commented in conclusion that the "United States still leads in the area of basic knowledge."

Dr. Donavan A. Swanson, consultant to the commander of the Air Force's Ballistic Missile Division at Los Angeles, also addressed the group.

"The future of freedom, itself, may be at stake in our race to win and hold superiority in the weapons which control air and space," Dr. Swanson stated, "Time is decisive."

"Up to this time," Dr. Swanson said, "all major milestones have been met on schedule in the Air Force program."

He stressed that, "We are now well along in the testing phase of the program. Missiles which a short time ago existed only on the drawing board have successfully completed captive testing; a number of missiles have been flight tested successfully. Thor and Atlas missiles have been fabricated and transported to Florida on schedule and tested successfully. It should be pointed out that the missiles presently undergoing tests represent the operational configuration. These are not merely devices especially fabricated for the test purposes.

"Our studies have shown that by using our presently existing rocket engines and missiles, we can provide both at the earliest date and at the greatest economy not only unmanned reconnaissance of the moon but also a basic vehicle for manned space flight."

Dr. Swanson concluded: "Many far-reaching potential capabilities are apparent as we look more into the future and develop the possibilities of thermonuclear propulsion and payloads up to hundreds of tons. These few specific examples of capabilities now at hand and their times of realization, however, strongly emphasize the requirement for initiating these projects immediately if we are to have any chance of leading in space technology in the 1965-1970 time period."

Henry McDonald, Secretary of the Kellogg firm, as chapter president was chairman of the meeting.

At its February meeting, notice was served on New York that the Chicago Chapter is out to become AFCEA's largest.

In a keynote address delivered at the dinner-meeting, held at the new Automatic Electric plant in Northlake, Illinois, chapter president McDonald called on the 397 persons present, "to help make this chapter not only the best, but the largest in the entire association. And I don't mean second largest," he added. "I mean larger even than New York. We can do it."

Highlight of the meeting followed when D. H. Deaver, President of Automatic Electric Sales Corporation, host for the evening, briefed the members

Dayton-Wright—A joint meeting with the local IRE section on February 12th featured Cyril N. Hoyler, Manager of Technical Relations, RCA Laboratories, as the principal speaker. Pictured at the head table are, left to right: Mrs. J. B. Rippere and Col. J. B. Rippere, executive vice president of the Dayton-Wright Chapter; Paul H. Clark, AFCEA Regional Vice President; Mr. Hoyler, and Lt. Col. J. H. Terrell, vice president of the chapter.

and guests on the features of the new Automatic Electric plant, one of the largest industrial facilities in the midwest.

Mr. Deaver's remarks were followed by a guided tour of the 1,520,000 square foot manufacturing center and the General Telephone Laboratories.

Dayton-Wright

An amplifier of light, an electronic cooling system with no moving parts and a 4-pound portable transistorized television camera are among the recent electronic developments that were discussed and demonstrated February 12th, by Cyril N. Hoyler, Manager of Technical Relations for RCA Laboratories, Radio Corporation of America, before a joint meeting of local members of the AFCEA-IRE in the Biltmore Hotel Ballroom.

Mr. Hoyler's demonstration-lecture, called "New Adventures in Electronics," featured some of the latest achievements in research at RCA's David Sarnoff Research Center in Princeton, N. J., where a staff of some 250 scientists and engineers is engaged in studies and developments ranging over the entire field of radio, television, acoustics and electronics.

As one illustration of work in solid-state electronics, Mr. Hoyler discussed and demonstrated the properties of electroluminescence and photoconductivity and their applications in an experimental light amplifier. Other demonstrations showed the principles of electronic refrigeration and "Electrofax," a system of high-speed electronic photography.

In the field of television, Mr. Hoyler demonstrated an experimental miniaturized industrial television camera, using a half-inch vidicon and 19 transistors. Using about 5 watts of 60-cycle power, the camera generates a full television signal on either channel 2 or 3 which can be fed to a conventional television receiver.

Mr. Hoyler also discussed the operation of the RCA Electronic Music Synthesizer, an electronic system capable of generating any tone produced by the human voice or any musical instrument, as well as tones beyond the capabilities of a voice or a conventional musical instrument. Using specially-built equipment, he demonstrated the principles of the system in which music is pre-set in coded form and fed into electronic circuits in any variation the mind can conceive, and then played several selections of synthesized music.

Decatur

Annual elections were held on February 6th, with Lt. Col. Nicholas S. Munson of the Decatur Signal Depot chosen to head the chapter during the coming year.

Other new officers were elected as follows: 1st vice president—Robert E. Matteson, Illinois Bell Telephone Co.; 2nd vice president—Elmer Cupp, Decatur Signal Depot; secretary-treasurer—Fred H. Zickuhr, Decatur Signal Depot; board of directors—Henry E. Malone, Decatur Signal Depot; James L. Buck, Decatur Signal Depot; Roman W. Wojcicki, Decatur Signal Depot; Marvin R. Buechler, General Electric Co.

Adolph Hetzler, outgoing 1st vice president, presided over the meeting and introduced Lt. Col. Robert E. Starr, new commanding officer of the Decatur Signal Depot. Colonel Starr stressed the importance of the AFCEA and assured support of the chapter's activities.

In accepting the presidency, Colonel Munson called for a diversified program and a membership drive to create more interest in the local area.

Fort Monmouth—Brig. Gen. Earle F. Cook, Commander of the Army Signal Engineering Laboratories (second from right) welcomes Ben Adler, President of Adler Electronics, guest speaker at the chapter's February meeting. Others, left to right, are Larry Holt, Stewart-Warner Corp.; Norman Freeman, Stromberg-Carlson Co., and Harry Ross, chapter secretary.

Fort Monmouth

"Bringing TV to the Have-Nots" was the program subject of the February 19th dinner-meeting at the Officers Club. Ben Adler, President of Adler Electronics Company, New Rochelle, N. Y., was the guest speaker.

At an executive committee meeting on February 6th, the following were named to the chapter's board of directors: Maj. Gen. W. P. Corderman, Brig. Gen. A. F. Cassevant and Col. A. T. Stanwix-Hay.

To further publicize its activities, the chapter is now on the air twice weekly on WH2G, a privately owned station covering Monmouth, Ocean and Middlesex Counties. A five-minute spot at 4:55 P.M. gives out AFCEA and Fort Monmouth Chapter information, including meeting announcements.

Gulf Coast

On January 14th, members and guests met at Gus Stevens Restaurant and heard Capt. Robert J. Spence talk on the International Geophysical Year.

Captain Spence discussed the purpose of the IGY and the data gained from research by the participating countries. He also described "Operation Moon Watch" at Point Cadet where a team of sixty volunteers were the first set up on the East-West line to observe when Russia fired its first satellite.

The program of the February 4th meeting, held at Baricev's Restaurant, consisted of a lecture-demonstration on world-famous diamonds and the part industrial diamonds play in the manu-

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London—Pictured here are some of the 160 members and guests who attended the January 30th meeting to hear addresses by Maj. Gen. A. L. Pachynski, Director of Communications-Electronics, USAF, and Richard C. Kirby of the National Bureau of Standards, Boulder, Colorado. British guests at the head table included Air Vice Marshals J. G. W. Weston and Dalton-Morris.

facture of copper wire for use in communications. The speaker was Mrs. Ethel Barnett of the Southern Bell Telephone and Telegraph Company in Biloxi.

Kansas City

Lee L. Eastmond, Defense Communications Manager of the American Telephone and Telegraph Company, addressed the January 23rd meeting.

With "Communications Aspects of the SAGE Project" as his subject, Mr. Eastmond discussed the related communications facilities used in connection with this project. He used color slides and a special film on SAGE to illustrate his presentation.

The dinner-meeting was held at the Wishbone Restaurant in Kansas City and was attended by some eighty members and guests.

London

Highlight of the January 30th meeting was a conducted tour of the "Aberdeen Works" of Cossor Radar & Electronics Co., Ltd., in London.

The displays and exhibits included:

1. Automatic Production: A working demonstration was given of the machine designed and built by the engineers of Cossor Radio & Television, Ltd., for the automatic high-speed production of printed circuits.

2. Instruments: A display of the range of electronic instruments developed and manufactured by Cossor Instruments, Ltd., was shown. The major groups of instruments in the range are oscillographs and FM generators for RF and IF alignment. Other instruments include an ultrasonic flaw detector, the Hydraudyne for pressure-testing and a salinometer which automatically monitors the salt content of boiler feed water and raises an alarm if the concentration gets too high.

3. Primary Radar: Two major equipments made by Cossor Radar & Electronics, Ltd., were shown. Both were S-band M.T.I. radars designed for a surveillance role at airports. The larger of the two, A.C.R.6, of which a production model was shown working, employs a hard-tube modulator working at 30KV. This, combined with the requirements for built-in video mapping facilities, makes the equipment very large. The other radar, C.R.21, has the same general performance as the A.C.R.6, but, as it uses a soft-tube modulator, does not have built-in video mapping (which can be supplied externally) and incorporates a number of technical improvements, it is very much smaller. A complete installation can be made in a single vehicle with a total weight of five tons.

4. Secondary Radar: An airborne transponder was displayed. Also, as an example of the use of printing techniques in aerial design, an L-band aerial was shown. These equipments are both designed and manufactured by the Radar Company.

5. Striplines: Some examples of this technique of construction of microwave components were on show. The Radar Company is one of the few firms in England with experience of the special techniques of design and manufacture involved. The art was pioneered in the U.S.A.

6. Communications: Cossor Communications Co., Ltd., showed some of their recently developed communications equipment, of which the major item was their lightweight VHF walkie-talkie. This has an output of 150-250mW depending on frequency, a receiver sensitivity of 2uV for 20dB S/N at + 1kc/s and can be operated continuously for 10 hours; yet its total weight, including battery, is only six pounds.

Upon completion of the tour, the group proceeded to the Columbia Club Hotel for cocktails and dinner. Mr. Henry Chisholm, Managing Director of A. C. Cossor Co., Ltd., welcomed the chapter and gave a short resume on the activities of his company. He was followed by Mr. K. E. Harris, B.S.C., M.I.E.E., S.M.I.R.E., Director of Research for Cossor Radar & Electronics, who discussed "Radar Identification for Traffic Control."

Maj. Gen. Alvin L. Pachynski, Director of Communications-Electronics, Headquarters USAF, Washington, D. C., and Mr. Richard C. Kirby of the National Bureau of Standards, Boulder, Colorado, were guest speakers at the February 20th meeting held at the Columbia Club Hotel.

General Pachynski, National Vice President of the AFCEA, spoke on "Techniques Now Being Studied by the Air Force on 'Over-the-Horizon' Methods of Communications."

Mr. Kirby, Chief of the Ionospheric Research Division, N.B.S., presented a paper on some of the technical and theoretical aspects of the program. Two methods were defined by which long distance wire and wireless communications are now maintained. The methods are termed "Scatter" and refer to Ionospheric "Scatter" which permits teletype circuits to be maintained from 600 to 1200 miles in distance. Additionally, there is tropospheric "Scatter" which is a method of providing multi-channel voice and teletype communications over distances from just beyond the line-of-sight, to somewhat greater than 600 miles. He also discussed the problems of long distance communications in the northern hemisphere, referring to the periodic and extended outages caused by auroral disturbances.

Northwest Florida

The January 22nd meeting, held at Eglin Air Force Base, was addressed by AFCEA Executive Vice President W. B. Goulett, who reported on association affairs and outlined plans for further growth and activity.

Prior to the meeting, chapter officers met with Captain Goulett for a discussion of local chapter problems.

Orange

The program presentation at the chapter's February 20th dinner-meeting was made by Charles R. Losh of the Orlando Division of The Martin Company.

With the aid of slides, Mr. Losh reviewed the old manual warning system. He also gave a brief description of the "Dew Line," "Mid-Canada," "Pine Tree," "Picket Ships" and the defense systems of this country's major protection areas.

Mr. Losh then described the Martin "Missile Master System" newly installed at Fort Meade at a cost of $9,000,000. This system went into operation on December 5, 1957. A recently de-classified color sound film, entitled "The Missile Master System," detailed the complex automatic and inter-locking features of this installation which prevents attacks on friendly aircraft and collision between "Nike" missiles.

Paris

The chapter's winter meeting featured the Western Electric film, "Arctic Mission," which presents the story of the Dew Line project.

The film locates the general route of Dew Line across the Arctic, shows the character of the terrain, difficulty of transport, and early efforts to hold on and supply the first parties, developing the theme of distance, cold, exposure and labor in terms of air and sea approaches, snow and icy winds. It further shows how speed of effort and closely-timed supply work led to success, when men were able to use machines and vehicles to do vast jobs, with the resultant transformation from small tent camps to full grown Dew stations with power, heat, light, food and all equipment.

Also covered by the film are Air Force inspections, tower work, ice strips, concrete work, cables and guys, erection teams, modular construction, interiors and power installations.

Philadelphia

Rear Adm. Richard F. Mandelkorn, USN (Ret.), recently Commanding Officer and Director of the Naval Radiological Defense Laboratory, addressed the chapter on February 26. His subject was "How Can We Live With The Atom."

The meeting was held at the Philco Corporation's Government and Industrial Division plant, with a pre-meeting dinner at the Park Drive Manor in Germantown.

San Francisco

January 16th was the date of the annual meeting for the election of officers and directors for 1958, held at the Officers Club, Presidio of San Francisco.

The new officers were named as follows: president—Maj. T. D. Razovich, USAR, Don Lee Broadcasting System; vice presidents—J. T. Chatterton, Mackay Radio & Telegraph Co.; Col. H. L. Schnoor, USAR, Pacific Tel. & Tel. Co.; secretary—C. V. N. Steffen, Pacific Tel. & Tel. Co.; treasurer—J. F. Parachini, Radio Marine Corp.; historian—Lt. Col. W. G. Damerow, USAR, Pacific Gas & Electric Co.

New Directors—Col. H. L. Purkhiser, USA, Signal Officer, Headquarters Sixth Army; Maj. H. C. Kahrmann, Jr., USAFR, Lenkurt Electric Co.; Capt. H. H. McCarley, USN, Director of Communications, Western Sea Front; Col. J. A. Bennett, USAF, Western Air Defense Force; Cmdr. H. M. Anthony, USCG, Chief Electr. Engrg. Sect., 12th Coast Guard District; R. C. Gray, Remler Co., Ltd.; Lt. Cmdr. W. H. Phillips, USNR, Globe Wireless, Ltd.; J. W. Dunbar, American Tel. & Tel. Co., Long Lines.

The program consisted of the forty-five minute color film "Our Mr. Sun," which had been the first in the series of scientific films produced by the Bell System.

San Juan

The regular monthly meeting, held at Fort Brooke Officers Club on January 23rd, was presided over by James P. Fitzwilliam, 1956 chapter president who was returned to the presidency in December upon the transfer of Capt. Gifford Grange, USN.

Among the various guests and new members introduced were: Capt. Enrique Ruiz of the Air National Guard, a former member of the Scott-St. Louis Chapter, who gave a report on the activities of that group; Kenneth M. Barbier, President of the Radio Corporation of Puerto Rico, who spoke briefly on the operations of his company, and Charles Parnell from the Marine Coastal Station WPR of the South Puerto Rico Sugar Company at Ensenada.

George Alich, Civil Aeronautics Administration, was appointed chairman of the chapter's committee on vocational education which is to assist the Commonwealth Department of Education in setting up a technical training course for radio operators and technicians.

Announcement was made of the forthcoming transfer to New York of John M. Golden of RCA Communications, who was accorded the chapter's good wishes.

At the conclusion of the meeting, a military film on the latest in guided missiles was shown.

Scott-St. Louis

A reverse twist in the wartime practice of counting enemy aircraft "kills" showed up in the U. S. Air Force's record books as a series of "saves" that delivered 265 emergency-gripped American aircraft worth $119,205,428 from "almost certain destruction" in 1957.

The radio and radar men of the Airways and Air Communications Service provided safe passage to earth for 255 military and 10 civilian airplanes trapped aloft by blinding weather, instrument failure and fuel emergencies. These included 162 jet fighters, 20 jet bombers, 88 conventional military aircraft and the 10 civilian planes.

Scott-St. Louis—Brig. Gen. Daniel C. Doubleday, Commander, Airways and Air Communications Service, who addressed the February 7th chapter meeting.

Brig. Gen. Daniel C. Doubleday, Commander, Airways and Air Communications Service, revealed this performance in an address before the chapter's February 7th dinner-meeting at Augustine's Restaurant.

General Doubleday said: "Nobody can estimate the worth of lives saved at the same time, but scores of these lives represented millions of dollars in training costs and polished military experience."

He explained that air traffic control around the world is only part of the AACS job of providing the U. S. Air Force with communications and flight facilities everywhere this side of the communist curtains.

With air traffic controllers handling nearly one million take-offs and landings monthly, General Doubleday said:

"This emergency work is done in AACS while its people are controlling routine air traffic. Any one of these 'saves,' itself, would be a sensation. But there are too many of them, and so they are commonplace with us."

AACS, comprising about one-third of the Military Air Transport Service's strength, controls air traffic from more than 260 points around the earth through radar's Ground Control Approach and Radar Approach Control, direction-finding radio and the alertness of its control tower operators.

Among the members and guests present were Ancil Z. Arseneau, president of AFCEA's Gulf Coast Chapter, and Maj. R. G. Ramsey, also from Gulf Coast.

South Texas

Paul L. Wilkins of the Southwestern Bell Telephone Company was guest speaker at the January 30th meeting which took place at the Fort Sam Houston Officers Club. The subject of his talk and demonstration was "Direct Distance Dialing," which included an explanation of the national numbering system for direct dialing.

During the business session, the fol-

San Francisco—Some of the new chapter officers elected at the January meeting appear above. Left to right: first row—C. V. N. Steffen, secretary; Maj. T. D. Razovich, USAR, president; H. L. Schnoor, vice president; J. F. Parachini, treasurer. Back row—H. C. Kahrmann, director; Lt. Col. W. G. Damerow, historian, and Capt. H. H. McCarley, director.

Southern California—Some of the chapter's officials are pictured with the guest speakers at the February 24th dinner-meeting which featured "Military Photography." From left to right are: L. D. Callahan, director, who acted as master of ceremonies; Lester R. Daniels, president; Douglas Shearer, Director of Research for MGM Studios; Dr. Tremaine, Chief of Sound Division, USAF Lookout Mountain Laboratories; John Inwood, first vice president, and Col. Frank J. Shannon, Sr., USAF (Ret.), chapter secretary.

lowing slate of chapter officers was elected for 1958: president—Col. Will D. Joslin, Signal Corps, U. S. Army; vice presidents—Col. Robert J. Kuehn, U. S. Air Force; J. D. Rainbolt, Southwestern Bell Telephone Co.; Oscar M. Screws, Western Union Telegraph Co.; secretary—Maj. Vincent Grzegorowicz, Signal Corps, U. S. Army; board of directors—Maj. Gen. Gordon A. Blake, U. S. Air Force; Lt. Col. Carl O. Duncan, Signal Corps; Henry S. Dunn, Kelly Air Force Base; S. J. Keane, Southwest Research Institute; Ralph N. Ness, Graybar Electric Co.; S. H. Simpson, Jr., Southwest Research Institute; Col. Albert H. Snider, U. S. Air Force.

Committee chairmen were selected as follows: membership—William Brock, Southwestern Bell Telephone Co.; program and publicity—Branch T. Masterson, Hearst Advertising Service.

Southern California

"Military Photography" was the topic chosen for the February 24th meeting which was also the chapter's annual ladies' night.

Chapter President Les Daniels opened the meeting with a brief discussion on necessary chapter business. Chapter Secretary Frank Shannon then introduced the persons responsible for two static floor displays of photography equipment from the Army Pictorial Center under U. S. Army's Fort MacArthur. This personnel included Capt. Hinshaw, Lt. Gramstead and Mr. Jim Waldron, plus two uniformed Signal Corps enlisted personnel. This Army display included projection equipment, a new method of making transparencies, an instantaneous Polaroid type of still photography, and numerous other pieces of equipment. Dr. Karl Fruend, head of Photographic Research of San Fernando Valley, was responsible for his company's static display of miniaturized television, camera, and associated equipment. Eastman Kodak furnished four large still Kodachrome photos of pedestal-mounted beautiful scenics.

The program opened with a color film showing the actual firing of the famous ICBM Atlas missile at USAF's Patrick AFB by Convair. Then Dr. Tremaine, Chief of the Sound Division, through the courtesy of Col. Warndorf, Commander of the 1352nd Motion Picture Squadron (USAF Lookout Mountain Laboratories) gave a talk on the highly important activities of this unique USAF installation. Dr. Tremaine is well qualified in motion picture and sound work, having had over thirty years' experience in the industry. He is a former Lieutenant Commander in Naval Electronics, author of sixteen technical papers and two books, and is a member of the Society of Motion Picture and Television Engineers, and a Fellow of the Audio Engineering Society. Dr. Tremaine used slides to aid him in his description of the aforementioned activity. Time did not permit the showing of one of Lookout Mountain Laboratories' famous products entitled "Target Nevada."

L. D. (Dave) Callahan, a chapter director, performing as Master of Ceremonies, introduced the guest speaker, the first of which was the well-known Director of Research for Metro-Goldwyn-Mayer, Douglas Shearer, who spoke on editorial maneuvers in motion picture photography and script writing.

Ray Meyers, chapter treasurer and AFCEA regional vice president, arranged a Navy film entitled "Navy in Science." Unfortunately, time did not permit the showing of the U. S. Army Signal Corps film "The Combat Photographer," but this film will be shown at a future meeting.

Approximately 150 were in attendance, of which some sixty were feminine guests. Mr. Bauer, Public Relations Director for Autonetics Division of North American Aviation, donated a corsage of orchids for each lady attending.

The chapter's newest group membership—Lockheed Air Service Co., Inc., of Ontario, California, was represented by three of its executives and its ladies, namely, Mr. and Mrs. Ralph Osborne,

Switzerland—A tour of CERN, the European Center for Nuclear Research in Meyrin, highlighted the chapter's January meeting. Photo at left shows L. W. Hayes, Vice Director of CCIR (International Radio Consultative Committee), pointing out an item of interest to Capt. Gerald C. Gross, president of the chapter. Pictured during the tour, at right, are AFCEA members Jack Reid of RCA, John Gayer, Intl. Frequency Registration Board, past chapter president, and John Gracie, IFRB, and an unidentified guest.

Executive Vice President, Mr. and Mrs. Thomas Hinman, Assistant General Manager of Sales, and Mr. and Mrs. Charles Thum, Manager of Special Devices.

Switzerland

The chapter held its first meeting of 1958 at the Geneva airport restaurant, where, after a welcome by President Gerald Gross and a short business session, an excellent lunch was enjoyed by the members, their ladies and guests.

The feature of the day's activities was a visit to the European Center for Nuclear Research (CERN) in Meyrin, near Geneva. CERN is a unique example of scientific cooperation in the experimental field. No less than twelve European nations cooperated in building this center for pure scientific research on nuclear physics.

Thanks to the cooperation of CERN officials, the chapter group was able to visit two particle accelerators, the first being the 600 MeV synchro-cyclotron which is already in operation, and the second the 25 GeV proton synchroton now under construction.

The latter equipment is of particular interest as it is of very advanced design and, due to a new focusing procedure will have an elliptical tube, in which the particles are accelerated. The diameter of their circular path will be of the order of 660 feet. This, in turn, requires an accuracy of the order of $1:10^5$, which is a very difficult constructional feat.

In fact even the vibrations caused by the Atlantic waves beating on the French coast have been taken into account. When complete, the instrument will be able to give nuclear particles an energy which, at that time, will only be equalled by a similar instrument being built at the Brookhaven National Laboratories.

Washington

Military electronic aspects of current and future weapon systems of the Air-Space Age were discussed by Lt. General C. S. Irvine, Deputy Chief of Staff for Materiel, Dept. of the Air Force, at the regular monthly luncheon on March 4th at the Willard Hotel. Some 400 members and guests were in attendance.

General Irvine stressed the urgency and the highly transitional nature of today's task of producing high-performance air vehicles for national defense.

"This period of military hardware development," said General Irvine, "can best be characterized as the most severe transition that modern military science has experienced. This applies not only to the hardware itself, but also to the related concepts of roles and missions, our traditional military organizations, and priorities of civilian and military programs."

Describing current development-production programs of the Air Force, General Irvine mentioned a truly intercontinental high supersonic bomber, a long-range high supersonic interceptor, aircraft with normal operations over *Mach 3*, a long-range supersonic air-to-ground missile to be carried by the B-52, and a solid propellant intercontinental ballistic missile.

Washington—Lt. Gen. C. S. Irvine, Deputy Chief of Staff for Materiel, USAF, and principal speaker at the March luncheon-meeting, is shown with L. Harriss Robinson, president of the Washington Chapter.

"In addition," said General Irvine, "the Air Force has vigorous study programs in the major military mission areas for the future, particularly programs aimed at solving the problems related to very high speeds and high altitudes, and the natural transition to space operations."

Peering more critically into the future, General Irvine stated: "Our manned equipment will progress through the high supersonic regime, into the hypersonic performance areas. Effective altitudes will range from sea level to the upper edges of the atmosphere and on into true space operations. The new air machines must have range capabilities enabling them to remain aloft for much longer periods than is now possible with current power systems." Accuracy and speed of guided missiles must be greater than now obtainable, according to General Irvine, and they must be more self sufficient.

"The types of scientific and technical advances we are now making," he said, "will dictate that certain performance characteristics be engineered into the true space vehicles." He described one space vehicle under study by the Air Force that can hover under control over any given portion of the world.

"A manned space vehicle," said General Irvine, "will have highly specialized capabilities. Within approximately one year, the Air Force expects to fly the X-15, one of the forerunners to actual space weapon systems. It is expected to reach altitudes of over 100 miles, and travel at speeds of over 3,500 miles per hour."

Inherent in this weapon system progress is the increasing and important role to be played by electronics, according to the General. "There will be a pressing need," he said, "for highly effective telemetering devices to be used in space vehicles. Highly specialized ground observation and control stations will be necessary to have truly space-wise communications."

Then, as now, an urgent need exists for an effective ballistic-missile Early Warning System. "To provide such a system," said General Irvine, "radar sets with ranges up to 3,000 miles must be geographically located to provide maximum amount of coverage, and minimum reaction time."

As advances are made in the techniques as well as applications of electronics along the progress path toward true space operations, the role of electronics will become increasingly dominant. "Already," said General Irvine, "electronics account for well over 40% of missile components, subsystems, and support equipment. And the time may come when propulsion systems will be electronic in operational characterstics. Then the percentage may go even higher."

An enthusiastic audience received General Irvine's address, and the event was well covered by local press and national magazine representatives.

Seated at the head table during the luncheon and address were: Lt. General C. S. Irvine, Deputy Chief of Staff for Materiel, USAF; Maj. General Alvin L. Pachynski, Director of Communications-Electronics, USAF; Maj. General Benjamin J. Webster, Director of Programs, Deputy Chief of Staff for Personnel, USAF; Maj. General Albert G. Hewitt, Director of Maintenance Engineering, Office of the Deputy Chief of Staff, USAF; Maj. General Charles J. Bondley, Jr., Director of Supply and Services, Deputy Chief of Staff for Materiel, USAF; Brig. General Bernard M. Wooton, Deputy Director of Communications-Electronics, USAF; Mr. Paul Goldsborough, Staff Director for Communications, Office of the Assistant Secretary of Defense for Supply and Logistics, and member of the Board of Directors, AFCEA; Mr. James M. Bridges, Director of Electronics, Office of the Assistant Secretary of Defense for Research and Development; Mr. Max Golden, Deputy Assistant Secretary of the Air Force for Materiel, and Mr. L. Harris Robinson, Motorola Corporation, and president, Washington Chapter, AFCEA, who was the convening chairman at the meeting.

ITEMS
From Governme

POWERFUL RADAR-LIKE SIGNALS

Radar-like signals many times more powerful than previously believed possible have been transmitted by the Cornell Aeronautical Laboratory, Buffalo, New York, under an Army Ordnance research contract applicable to U. S. Army missiles systems.

The laboratory said it has successfully transmitted radar-like micro-wave signals at the previously unheard of peak radiated power of 21 megawatts. This new power not only extends the range of radar but makes possible a stronger radar signal that penetrates atmospheric layers. The record power was reached by use of a special micro-wave generator.

ICBM's are difficult to detect because of their extreme speed and relatively small nose cones. However, the greater signal strength and range made possible by the more powerful radar signal "betters the chances of detecting the ICBM."

This is considered a significant discovery in the development of future detection equipment because it increases the peak power which can be emitted by radar.

SINS UNDERGOES TEST

The Ship's Inertial Navigation System (SINS) has recently undergone a testing program aboard the Navy's experimental ship, *Compass Island*.

Developed primarily for use in nuclear - powered, missile - launching submarines, SINS is similar in principle to inertial navigation systems. Completely independent of stars, radio, radar or other external conventional methods of navigation, it employs high-precision gyroscopes, accelerometers and integrators which continuously measure and record the minutest motions of the submarine as it journeys beneath the sea. Essentially a computer, the system provides precise ship's position in latitude and longitude coordinates, ground speed and pitch and roll information—all of incredible accuracy.

Compass Island is the "forerunner for a fleet of submarine and surface vessels that will provide the Navy's Fleet Ballistic Missile program with the elements of mobility, concealment and readiness." Captain L. L. Schock, Navigation Branch Head,

S OF INTEREST
ent, Industry and the Services

ecial Projects Office, said, "It has monstrated that we have now hieved the necessary degree of vigational accuracy to assure suc-ss of the Fleet Ballistic Missile pro-am."

The Ship's Inertial Navigation Sys-m is based on fundamental investi-tions and research performed for e Navy by Dr. Charles S. Draper of .I.T. and was further developed for anufacture by Sperry Gyroscope ompany.

EW SPACE XPLORATION OMMISSION

Creation of a Federal Space Explo-tion Commission with full power d resources to undertake long-range ace programs has been urged by e National Society of Professional ngineers (NSPE).

The NSPE, in a statement ap-oved by the group's Board of Di-ctors stated, among other things, at because this country has as great reservoir of scientific and engineer-g knowledge and skill as can be und in any nation on earth the ace programs must be backed by ne full organization and resources the United States of America."

EW ELECTRON TUBES

Development of miniature electron bes capable of operating at tem-ratures ranging from 900° to 00° Fahrenheit has been an-unced by the General Electric Re-arch Laboratory.

The experimental models, which e still in the laboratory stage, will ve the ability to withstand high mperatures due to extensive weight ductions.

The tubes, constructed of layers of anium and a special ceramic, are aped like flat disks and measure ly ¼ inch in diameter and ⅛ inch ick.

LECTRA PROP-JET RANSPORT

First demonstration rides in the w Electra prop-jet transport are in e making for customer airline ex-utives, Lockheed Aircraft officials nounced.

Eastern Airlines is scheduled to ke delivery on the first of its 40 air-ers in September. American's first nsport—in an order of 35—will delivered in December.

The first prop-jet Electra hit a new top speed of 478 m.p.h. and has flown higher than 30,000 feet. It has accumulated more than 100 hours in the air since it first flew on December 6.

NEW WEATHER CHAMBER INSTALLED

The Westinghouse Electric Corporation has developed a new environmental test chamber to test plane equipment under different degrees of temperature. The chamber is installed at the company's Friendship Airport plant in Baltimore, Md. It will duplicate blazing temperatures and numbing cold within minutes to make sure that automatic armament systems for Navy and Air Force planes will work anywhere regardless of environment.

The chamber will simulate the altitude of 90,000 feet, and temperature ranges from minus 105 degrees to 500 degrees and humidity approaching 100 percent.

MICROWAVE-MOBILE RADIO IN USE

Installation of one of the Nation's largest microwave-mobile radio systems for highway communications will be introduced by the Radio Corporation of America for the Illinois State Toll Highway Commission. It will cover the 187-mile Illinois Toll Highway system with microwave, mobile radio and teletypewriter facilities for police, maintenance, toll-collection and general administrative communications.

A special feature of the installation will be the use of two microwave tone channels for automatic transmission of toll-collection data.

NEW SUBMARINES TO CARRY POLARIS

The construction of three nuclear-powered Fleet Ballistic Missile (FBM) submarines will soon get under way following their recent approval by Congress in the Fiscal 1958 supplemental budget. The Electric Boat Division, General Dynamics Corporation, will build two submarines, and the Mare Island Naval Shipyard will build one.

These submarines are designed specifically for carrying and launching the POLARIS missile. They will dif-

Small, lightweight Three Commutator Dynamotor for airborne transmitting and receiving equipment

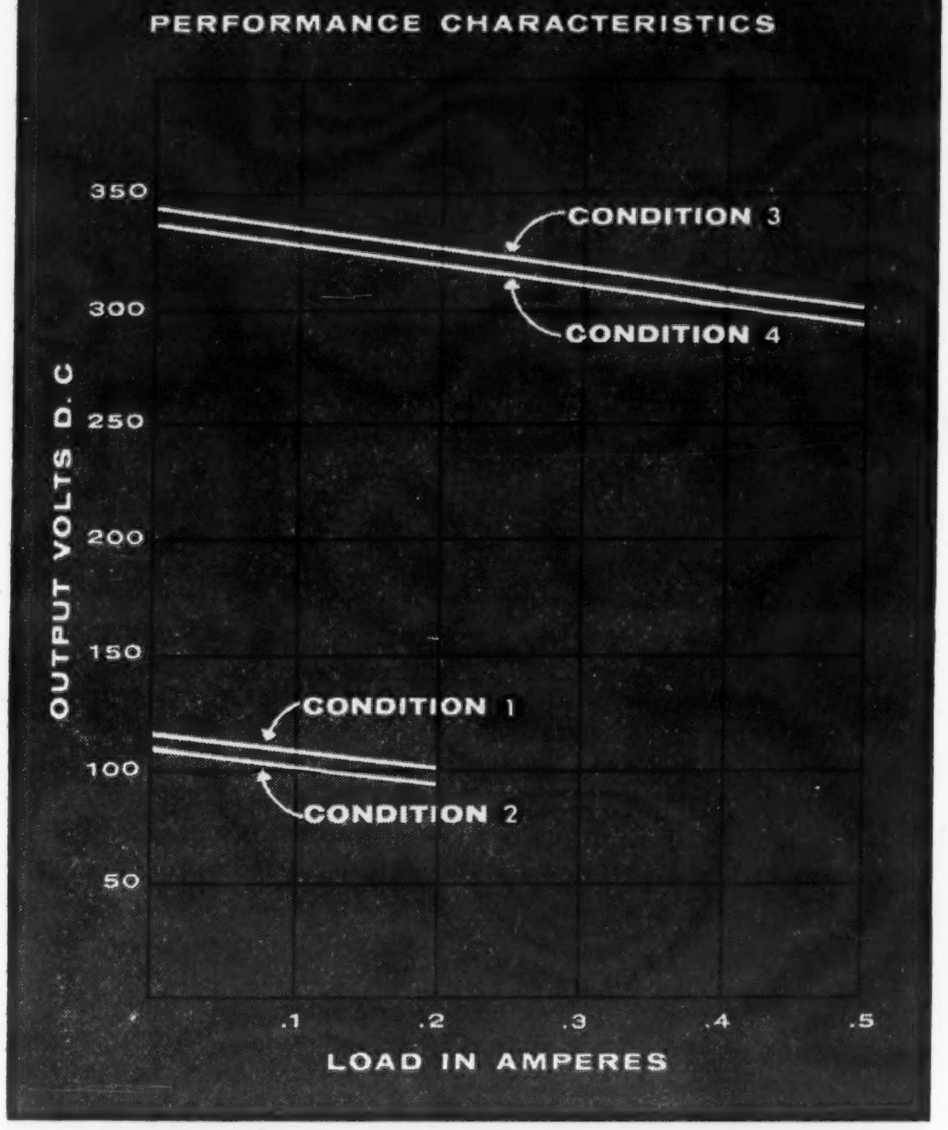
SANGAMO SP 17

(DUAL OUTPUT or DUAL INPUT)

Here is a "two-in-one" dynamotor that is small in size, light in weight, and highly efficient for both transmitting and receiving equipment. Its quality is consistent with MIL-D-24 specifications for aircraft, marine, and "Hi-Gee" (missile) usage.

Typical Rating:	Weight	6 lbs.
	Diameter	3½"
	Length	7"
	Input 26 volts at 10 amperes	
	Output A 100 volts at .200 amperes	
	Output B 300 volts at .500 amperes	
	Temperature rise 30°C	
	Ripple voltage 1% maximum	

Performance characteristics of the SP17 are shown in the chart at left.



SP17 DUAL OUTPUT

CONDITION ❶ = Output A with no load on B
CONDITION ❷ = Output A with full load on B
CONDITION ❸ = Output B with no load on A
CONDITION ❹ = Output B with full load on A

SANGAMO GY-25 "TWINVOLT"

This dynamotor, originally designed for mobile communications equipment, operates at full efficiency at either 6 or 12 volt input, but can be either dual input or dual output. Maximum output 180 watts, intermittent duty.

Write for full information, or for engineering help with your power planning. Sangamo's engineering staff will be glad to assist you.

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

SG58-1

fer from nuclear-powered submarines now under construction chiefly in their missile features. They will be equipped with SINS, the Navy's revolutionary new navigation system, and with new stabilizing and electronics equipment incorporating the most recent engineering advances.

ADVANCED RADIO EQUIPMENT

The DuMont Field Engineering Service Department, in a 60-day period, modified and installed advanced radio equipment in 250 F9F-6 aircraft of the Naval Air Reserve Training Command at twelve Naval air stations throughout the United States.

Specific equipment installed was the VOR (voice-omni-range) communications system, used by pilots to obtain their bearings in flight and determine their exact position.

RELOCATION OF NORTH POLE

Relocation of the North Pole has been proposed as an aid to polar navigation. This suggestion was made by Patrick J. McKeown, Ford Instrument Company, Long Island City, N. Y., in a talk at the Institute of Radio Engineers.

According to Mr. McKeown, numerous longitudinal lines converging at the poles complicate the navigation of high-speed jet planes over the North Pole region. Greater distance between longitudinal lines at the equator would simplify this operation.

Mr. McKeown has recommended arbitrarily locating the North Pole at the junction of the normal equator and the 180-degree meridian. Such a step would place the new equatorial region on top of the polar region and the new "forbidden" area in the Pacific Ocean. Without the necessity of coping with an abundance of longitudinal lines, today's "robot" navigators could be used with minor changes.

The suggested pole is called the "Innorth Pole" after the Inverse Mercator system upon which it is based.

ROBOT COMPUTER

A device has been described which has the ability to "get right inside the brain." In a paper by Dr. W. J. Johnson of Defense Research Medical Laboratories, Toronto, Canada, a robot is depicted as capable of computing sensations of a man who is subjected to extreme test of acceleration and dizziness.

An assembly of gyroscopes attached to the subject's head comprises the apparatus and each sensing device is approximately the size of a spool of thread.

It is possible with this computer to determine a person's equilibrium and his impression of orientation and destination.

SPEED FOR BLINKERS

Washington's Naval Research Laboratory has been experimenting with red and green lights in an effort to speed up blinker signaling.

Due to the persistence of vision (the image of a bright light lingers on the human retina for an appreciable time after the light has gone out), the speed of flashing light Morse telegraphy is limited to 8 to 12 words per minute. Faster operation produces meaningless fluctuating lights rather than easily identified dots and dashes.

A two-color system (red for dots, green for dashes) would require additional intensity for the signaling light and somewhat greater complexity in its design. Another disadvantage would be the training needed to read such a system.

TELEVISED TELEPHONE

General Electric Company has announced that a system for transmitting pictures over conventional telephone lines by slow-scan television has been successfully demonstrated to the Military.

According to William J. Morlock, General Manager of the company's Technical Products Department, enginers will make the first installation for the Military some time this year

Because of security restrictions, Mr. Morlock did not elaborate but described slow-scan TV as a principle for reproducing televised pictures "at the rate of one image about every five to ten seconds instead of the customary 30 frames per second in commercial television." He said this principle reduces the bandwidth necessary for such transmission over regular telephone wires.

Names in the News

Brigadier General Earle F. Cook, USA, will succeed **Brigadier General Richard J. Meyer, USA,** as Chief of the Research and Development Division in the Office of the Chief Signal Officer, Washington, D. C., in May. General Meyer will be assigned to a logistics position with the U. S. Army in Europe. General Cook is currently the Commanding General of the U. S. Army Signal Engineering Laboratories at Fort Monmouth, N. J.

Dr. Lloyd V. Berkner, distinguished scientist, has been elected to the board of directors of Texas Instruments, Incorporated. Dr. Berkner is President of Associated Universities, Inc., New York City. He is active in organizations of global scientific interest and is Vice President of the Special Committee of the IGY.

Edwin Dyke has been appointed as an Assistant Chief Engineer of Page Communications Engineers, Inc. Communication facilities of his design are in use on the "White Alice" continental defense network in the Arctic.

Colonel Charles W. Gordon, USAF (Ret.), has been appointed Manager of the new Rome, New York office of RCA Defense Electronic Products. Former Commandant of the Air Force Technical Training School, Belleville, Ill., Colonel Gordon has had 28 years of experience in military communications.

Henry Lehne has been appointed Vice President of Sylvania Electronic Systems, a division of Sylvania Electric Products, Inc. Mr. Lehne continues as General Manager of the division. Prior to joining Sylvania in 1953, he served in various engineering and sales positions with Republic Aviation Corp.

John H. Mueller, Vice President of RCA Communications, is on a special leave of absence while serving as Manager of Ballistic Missile Early Warning System Communications for the Missile and Surface Radar Department of RCA Defense Electronic Products.

Ralph R. Robertson has been appointed General Manager of Lenkurt Electric Company's newly formed division to handle increased military business anticipated as part of the accelerated national defense program. Mr. Robertson joined Lenkurt in 1954 as Contract Administration Manager, and later was Executive Assistant to the Commercial Vice President.

Dr. Wendell B. Sell has been named General Manager of Associated Missile Products Company, Pamona, California, a division of American Machine and Foundry Company. This new job will supplement Dr. Sell's duties as a division Vice President of AMF.

William F. Woodbury has been recently appointed Assistant to the Vice President of Airborne Instruments. Mr. Woodbury was formerly the Sales Manager of the Government and Commercial Division of Hazeltine Electronics.

The film that "completes the team" of the world's fastest and finest color motion picture emulsions...

NEW 16mm Super Anscochrome Tungsten Film

EXPOSURE INDEX 100

Super Anscochrome—daylight type—has set new standards for color photography. Now Super Anscochrome is made available in a Tungsten Type emulsion—with a Tungsten exposure index of 100—for 16mm motion picture work. Judging from the wide acclaim received by the daylight type Super Anscochrome, it promises to open-up new worlds in cinematography under existing and artificial light conditions.

Super Anscochrome's Tungsten speed does not mean a loss in color quality. As in all Super Anscochrome emulsions, greater color curve conformity means closer correspondence with subject color—from full intensities to pastels in highlight or shadow areas.

Processing may be carried out in regular Anscochrome processing chemicals. Forced development will give increases in speed to E.I. 160 with just slight loss in quality, and up to 200 if required.

Super Anscochrome Tungsten is at least three times faster than any Tungsten type color film you have ever used, and ten times faster than traditional color films. Try it on your next assignment. Ansco, Binghamton, New York. A Division of General Aniline and Film Corporation.

Ansco

Super Anscochrome Tungsten 16mm Film

NEW PRODUCTS FROM INDUSTRY

Electroluminescent Digital Indicator

Scientists at Westinghouse Electric Corp. in Pittsburgh, Pa., have developed a practical technique for displaying numerals or other symbols on a thin, flat, glowing electroluminescent screen.

Termed an "electroluminescent digital indicator," the instrument is claimed the first of its kind to be built entirely of solid-state elements. Its digital display screen, capable of use in broad daylight, offers speed and accuracy of reading since it eliminates watching dials and estimating markings in order to get the exact reading. The indicator is essentially a flat screen having a series of phosphor - coated electroluminescent strips which glow when energized electrically.

Compact, rugged and requiring low power easily met with miniature power supplies, the instrument uses transistors as switching elements.

A wide potential application exists for use of the instrument in industry, including uses in automation, process supervision testing and quality control.

Airborne Tape Recorder

An advanced magnetic tape recorder, designed to meet demands placed on airborne instrumentation during flight test, has been announced by Consolidated Electrodynamics Corp. of Pasadena, Calif.

IRIG and NATC specifications can be met or exceeded by the new instrument which operates at altitudes up to 100,000 ft. and in temperatures from —55 to —100 C. Among its advanced features are an electrical selection of all 6 tape speeds, the elimination of belts and pulleys, and a grouping of all controls on top of the instrument.

Contained within a lightweight cast magnesium-alloy case, the magnetic tape recorder (5-702) is available in 7 or 14-track models, using ½" or 1" tape respectively. It will also operate the standard NARTB 10½" or special CEC high-performance reels which furnish a recording time of 6½ hours at 1-7/8 ips.

Miniature Counter Tube

A miniature version of the 100 KC cold cathode decade counter tube has been developed by Sylvania Electronic Products, Inc., 1740 Broadway, N. Y. Designated Type 7155, the high-speed tube is equipped with 3 output cathodes in a T-5½ bulb.

Claimed to be of particular value in applications where size and weight are important factors, as in portable and airborne equipment, it may be used for both visual and electrical readout.

Portable Maser

Said to have important applications in space guidance and navigation, coded communications and Doppler navigation, the first portable, sealed ammonia-type Maser Oscillator has been announced by Polytechnic Research & Development Co., Inc., of Brooklyn, New York.

The unit generates a 23.870194 KMC/sec signal @ ±0.0000005 KMC. Weighing only 20 pounds, it occupies a volume of ¼ cubic foot with a stability of better than one part in 10^9. The Maser is claimed to have an excellent potential as a basic research tool for establishing new theories and re-evaluating existing theories in physics, chemistry and all branches of science.

Portable/Console TV

A convertible TV, easily transformed from a 21-inch portable into a console, has been announced by Sylvania Electric Products, Inc., 1740 Broadway, New York 19, N. Y.

For conversion, the speaker is taken from the removable receiver and is front-mounted in the console cabinet. Then the receiver is slid into place, becoming part of the floor model.

The convertible receiver has its own cabinet with side carrying handles for easy portability.

"Minoxo Indicator"

An oxygen indicator, said to be 20 times more sensitive than any previously available instrument in the U. S., has been placed on market by the Chemical Div. of Engelhard Industries, Inc., Newark 2, N. J.

Trademarked the "Minoxo Indicator," the instrument measures traces of molecular oxygen in a wide range of gases including hydrogen, nitrogen, ethylene, other hydrocarbons, either saturated or unsaturated, helium, argon, and other inert gases.

In addition to its laboratory potential, the device has process applications in atomic energy work, metals treating, and the manufacture of such products as chemicals, pharmaceuticals, electronic equipment, plastics, synthetic fibers, pigments, photographic supplies, petroleum derivatives, incandescent lamps, tobacco goods, and bottled industrial gases.

The two ranges of the instrument are 0-10 and 0-100 parts per million. When calibrated every 8 hours, it has a "conservatively estimated accuracy" of plus or minus 5% of full scale deflection. Registration of a change in oxygen concentration is 90% complete in 2¼ minutes.

The "Minoxo" cannot be used with sulfur, chlorine or carbon dioxide.

Improved Sound-Motion Projector

Bell & Howell of Chicago 45, Illinois, has announced a new model of their 16mm sound-motion projector which features factory-sealed lubrication along with a safety interlock which automatically disengages the rewind gear when the reel of film is removed.

This new "Filmosound 385" has a 15-watt amplifier and a voltage regulator which keeps voltage to the photocell constant. Reserve gain (not needed for normal operation) is provided to compensate for variation in soundtracks and to assure ample sound volume in low-voltage areas.

High-Speed Eraser For Magnetic Tape

The need for a high-speed, general purpose device that will uniformly restore all types of magnetic film or tape to their original states for re-use has been met by RCA's high-speed electrical eraser which "wipes" magnetic sound or picture recordings from a reel of up to 4800 feet of tape or film in 30 seconds.

Measuring 48 x 22½ x 15 inches, the instrument houses an automatic turntable on a sliding carriage which transports the tape into a large air-core erasing soil mounted on one end of the instrument. This coil was cited as an outstanding feature of the RCA development, assuring complete and absolute erasing. "Unlike conventional erasing coils, it contains no ferrous or paramagnetic elements that affect the stability and uniformity of the coil's magnetic field," a spokesman said.

The instrument is available in either video or audio model.

Only a few

Proceedings of the IRE

special issues

are still available Each issue of *PROCEEDINGS OF THE IRE* is the result of the most advanced thinking in the field of radio-electronics. Based on exacting research, and written by men who are foremost in their specialty, these issues are invaluable works of reference. This is also material not available from any other source. As the official publication of *The Institute of Radio Engineers,* PROCEEDINGS presents the years-ahead ideas on which new advances are based. These history-making issues, originally over-printed for reserves are rapidly being exhausted and will not be reprinted.

YOU CAN STILL GET:

VERY LOW FREQUENCY, *June, 1957* — New research in the very low frequency band, below 30 kc., opens up greater portions of the radio spectrum for communication purposes. VLF has many new and important uses. A reference work you'll need for years.

SINGLE SIDEBAND, *December, 1956* — A round-up of recent technical discoveries as presented by the Joint Technical Advisory Committee through its sub committee on Single Sideband techniques. This special study for the FCC points up the many advantages of single sideband.

FERRITES, *October, 1956* — This new group of solid state materials outmodes the intermittent "pulse" system of World War II radar. The ferrites allow simultaneous sending and receiving on a single microwave antenna; as well as full-power transmission in microwave ranges with reduced power loss and interference.

SOLID STATE ELECTRONICS, *December, 1955* — This issue heralds the arrival of a new epoch in radio electronics — the solid state electronics era. Defined and named with the birth of the transistor, this concerns the control and utilization of the electric magnetic and photic properties of solids. There are now whole new classes of electronic devices due to discoveries in this field.

SCATTER PROPAGATION, *October, 1955* — Here's radio history in the making. This issue presents practical application of a new principle in the fields of broadcasting and electronics. Thirty-five papers lay the foundation of a new means of communicating over long distances.

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Transistorized Flash Assembly

For the professional photographer, American Speedlight Corp. of Middle Village 79, N. Y., has introduced the first transistorized electronic flash unit incorporating design features that provide economy, portability and ruggedness.

The two models (A422, A423) of the flash unit feature two new power supplies: 100 watt-second B422; 200 watt-second B423. With a wide range of power from 25 watt-seconds to 200 watt-seconds, the units incorporate push-button switching from high to ¼ power. Additional features include two light-connectors, trigger-tube current for sensitive slave operation, AC operation, and "D" cells or rechargeable nickel cadmium battery. Respectively, the B422 and B423 weigh 5 lbs. and 3½ lbs.

Extremely Accurate Gyro

The achievement of extremely accurate gyro systems for stabilizing and guiding missiles, aircraft and even sea vessels is the result of "frictionless" gyros with near perfect precision, developed by Sperry Gyroscope Co., Div. of Sperry Rand Corp., of Great Neck, N. Y.

The breakthrough hinges on a method for controlling ball bearings within "simple" gyroscopes (devices with finely balanced spinning wheels inherently able to point continuously to a fixed position in space). Designated "Rotorace(TM)," the principle eliminates error-producing irregularities in the gimbal rings on which gyros are suspended by as much as 1200%, slashing random drift rates to ¼ degree per hour from a normal 3 or more degrees hourly.

Only slight increases in weight, cost, complexity, manufacturing or maintenance problems are said to be necessary in achieving Rotorace's highly improved accuracy.

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New Literature

Soviet IGY Activities Reported in New Series

A weekly publication of Soviet activities regarding the IGY is being prepared by the OTS, U. S. Dept. of Commerce, Washington 25, primarily for U. S. Government scientists. However, non-Government scientists may subscribe to the series for $10.00.

Information selected and translated from foreign-language publications concerns Soviet bloc plans together with endeavors in rockets and artificial earth satellites, upper atmosphere, meteorology, oceanography, latitude, seismology, glaciology, the Antarctic and other subjects.

Designated Order PB 131632 *Soviet Bloc International Geophysical Year Information*, the series will run from Feb. 14, 1958 to Jan. 2, 1959. Back issues will be supplied to subscribers.

Washington Missile Contracts Report

Potential contractors are being offered first-hand, immediately usable information obtained directly from various procurement officers and prime contractors throughout the Nation by means of a weekly service called *Washington Missile Contracts Report*, recently established by Vincent F. Callahan, Publisher, 1420 New York Ave., Washington, D. C.

The Report will concern contract and subcontract opportunities in the missile and satellite programs of Army, Navy and Air Force. Information is obtained by a series of interviews made by staff members of the Report. Lists of prime contractors and principal subcontractors, with their addresses, will be published in the Report periodically, together with data on projects underway or components being produced.

In addition, the Reports will detail Congressional activities on appropriations, will publish invitations to bid on missile and satellite contracts and will provide step-by-step instruction on all necessary procedures required, such as numerous forms describing the industry's facilities and the obtaining of security clearances.

Subscription rates are: 1 year, $75.00; 6 mos., $40.00; 3 mos., $25.00.

Qualified Products List

An agreement, concurred by the Secretary of Defense and implemented by the DOD instruction 2045.2, has resulted in a new approach for the formation of a Qualified Products List by the U. S. and by Canada.

The manufacturer of a particular electronic item which has met specifications for inclusion on the above List of one country may request the particular qualified product be listed on the other.

Missile Market Guide

A complete marketing directory of the missile industry will be published this month by American Aviation Publications, Inc., the publishers of *Missiles and Rockets* Magazine.

Titled "Missile Market Guide & Directory," the book will include: a section outlining procurement policies of the DOD; an alphabetical listing, by company, of over 2500 prime contractors, subcontractors and equipment manufacturers together with respective plant location, purchasing and sales personnel, and products; a cross-indexed catalog of over 4500 missile components with their manufacturers.

Subscribers to *Missiles and Rockets* will receive a free copy whereas others may purchase the book at a cost of $5.00 from the Circulation Director, AAP, Inc., 1001 Vermont Ave., N.W., Washington, D. C.

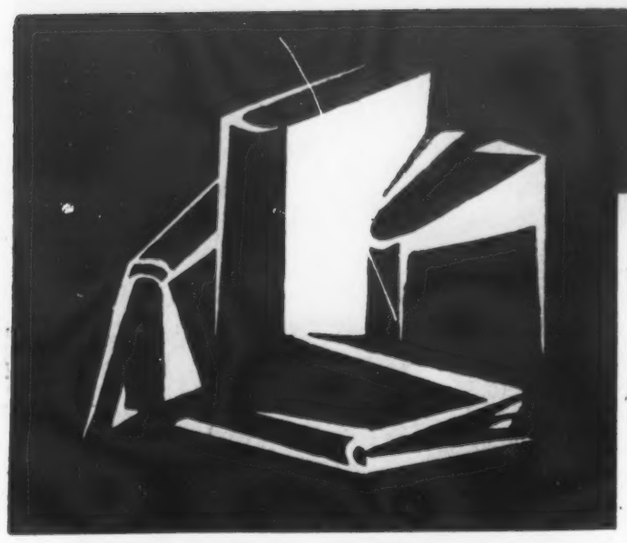
Russian and East European Accessions Indexed

To emphasize their thorough indexing in English of new publications coming into the U. S. from Russia and East Europe, the Library of Congress has changed the names of two monthly publications from "Lists" to "Indexes." Incorporating the title change, the publications are the *Monthly Index of Russian Accessions* and the *East European Accessions Index.*

Each index gives in English a monthly account of new material in a variety of subject fields as received by the Library of Congress and other American research libraries. They contain information *about* the content of books and articles. Elaborate subject guides in English permit a researcher to identify easily the material important to him.

The particular value of the Indexes to the scientist is exemplified by the fact that 54% of books and periodicals reported in Vol. 9 (April '56 - March '57) of the *MIRA* were in the field of science and technology.

The *MIRA* and the *EEIA* are obtained from the Government Printing Office, Washington 25, for $12.00 a year and $10.00 a year, respectively.



Books

ELECTRONIC SEMICONDUCTORS, translated by D. Jenny, H. Kroemer, E. G. Remberg and A. H. Sommer. McGraw-Hill Book Co., Inc., New York. 375 pages, $11.00.

Four members of the research staff at RCA Laboratories have made available a systematic and rigorous introduction to semiconductor physics by means of a well-illustrated translation of the second edition of *Elektronische Halbleiter*, by Eberhard Spenke.

The subject is developed logically from simple concepts. Fundamentals of important semiconductor devices, such as rectifiers and various transistor types, are treated thoroughly.

One of the book's outstanding features is the careful derivation of important relationships from precisely defined basic concepts and assumptions. Also noteworthy is the treatment of acceleration of electrons and of the Zener effect. In addition, a chapter is devoted to statistics and kinetics of electrons, as modified by electrostatic potentials.

Separate problems for each chapter have been added by the translators, in addition to a complete section on junction capacitance.

THE THEORY OF NETWORKS IN ELECTRICAL COMMUNICATION AND OTHER FIELDS, by F. E. Rogers, A.M.I.E.E. D. Van Nostrand Co., Inc., Princeton, N.J. 560 pages, $11.50.

Since engineering is ultimately concerned with practical things—and in this case the practical arrangement being the electrical network—it is of utmost importance that the student of electrical engineering develop an ability to resolve and simplify highly complex circuits in order to understand them and to apply successfully mathematical formulae to a numerical problem.

Lecturer in Telecommunications, Electronics & Electrical Measurements at the Polytechnic, London, the author has organized this clear and comprehensive study to be an excellent source for the development of such aptitude. All important circuit theorems are explained with indication as to their application to the solution of network problems. There is frequently demonstrated how solutions can be simplified by making justifiable approximations.

With the development of the electric-wave filter and other networks vital to the operation of multi-channel systems of communication, more involved circuitry has evolved and this, together with the use of high frequencies, has promoted greater attention on such matters as reflection and the matching of networks. Both important topics are thoroughly considered in the volume.

A multitude of illustrations and numerical examples appear along with a wealth of original work.

THE SEIZURE OF POLITICAL POWER—In A Century of Revolutions, by Feliks Gross. Philosophical Library, New York. 398 pages,

Authored by the editor of *European Ideologies* and professor of sociology at Brooklyn College, Professor Gross's book is an empirical, sociological study of violent transfer of power, defining revolution as either a spontaneous movement of the masses or as seizure made by a small powerful group. Emphasis is placed on *how* a revolution is planned and *how* it is translated into practical action with considerable detail given to personalities of individuals, various sectors of the social structure and the diverse value systems involved.

The core of the volume treats the Russian Revolutions from 1825 up through the recent unrest in Berlin, Poland and Hungary. Similarities between the latter revolutions behind the Iron Curtain and those of 1905 and 1917 are strikingly set forth. Other revolutionary events in Latin America, the Middle East and Asia are examined together with the changes in political structure.

Concluding the work, Part IV considers the struggle against seized power, the underground movement, political emigration and the problem of democracy.

PANZER LEADER, by Heinz Guderian, Chief of the German Army General Staff, translated by Constantine Fitzgibbon. Ballantine Books, Inc., New York. 400 pages, 50c.

This book, written by a professional soldier, is considered the most complete, factual, and revealing personal account of the war from the German side that has yet emerged.

General Guderian, who was made Chief of the General Staff in Hitler's army, gives a sober account of Hitler's mind and emotions and of the disintegration of a demented dictator and a demoralized entourage. Possessing the quality of a single-minded soldier Guderian at first was devoted to the German cause and there was no question in his mind about his duty of fighting for his country. But the disillusionment occurred when he came into close contact with the Fuhrer. Here, with brusque honesty and frankness of the comment, he describes conflicts that existed in Hitler's army and gives reasons for the total defeat and disintegration of the once great and powerful state.

BASIC TELEVISION (5 volumes), by A. Schure, Ph.D., Ed.D. John F. Rider Publisher, Inc., New York. Each paper-bound, $2.25; set of five, $10.00; single cloth-bound set, $11.50.

A product of three years' research and experimentation, Dr. Schure's 5-volume course in fundamental principles is considered to be an unusually lucid and complete presentation of the basic theory, operation and circuitry of black and white TV.

Following recommendations of advising industrial groups, there is a highly pictorialized method adopted in the presentation whereby each important concept treated has an illustration placed with the explanatory text to pinpoint essential material. Review pages spaced throughout each volume summarize the major points previously discussed.

Only a knowledge of basic electronics and radio is presupposed. The coverage, ranging from the creation of the TV image in the studio to its appearance on the receiver screen, contains many topics absent in the more traditional texts.

SECRETS OF SPACE FLIGHT, by by Lloyd Mallon. Arco Publishing Co., New York. 144 pages, $2.00.

An inspiring story of America's progress towards the launching of her first earth satellite, Mr. Mallon's timely book highlights, in detail, the problems which led to the announced delay of that launching.

The author presupposes no familiarity with the subject of space flight and rocketry and yet offers a wide coverage of outstanding facts including current development in space medicine and the space suit, an introduction to the men in space flight research and the most recent investigations concerning the flying saucer.

Association affairs

AFCEA's New Group Members

United Shoe Machinery Corporation

The AFCEA recently welcomed United Shoe Machinery Corporation of Beverly, Massachusetts, a firm which is concerned with the design, development and production of machine systems.

Members of the firm who will be company representatives in AFCEA are: Walter L. Abel, assistant director; Robert W. Ireland, department head; Ben Johnstone, assistant department head; Charles P. Cardani, design engineer; Orla Hall, manager, ordnance dept.; William W. Prichard, assistant director; John G. Hollick, department head; John E. Clemens, department head; John D. Hossfeld, section head; Carl Juhola, section head.

A. C. Cossor Ltd.

A distinguished British organization, A. C. Cossor Ltd., joined the AFCEA in March. This electronic engineering firm is located in London, Highbury Grove. The AFCEA London Chapter recently toured the "Aberdeen Works" of this company (see London, Chapter News).

Members of the firm who will be company representatives in AFCEA are: Henry Chisholm, Joint Managing Director, A. C. Cossor Ltd. and Chairman and Managing Director, Cossor Radar and Electronics Ltd.; J. S. Clark, Joint Managing Director, A. C. Cossor Ltd. and Chairman and Managing Director, Sterling Cable Company Ltd.; K. Newlands, Director (Export), Cossor Radar and Electronics Ltd.; F. J. Dellar, Director (Sales), Cossor Radar and Electronics Ltd.; K. E. Harris, Director (Technical), Cossor Radar and Electronics Ltd.; D. H. R. Archer, Secretary, Cossor Radar and Electronics Ltd.; I. Campbell-Bruce, Director (Sales), Cossor Communications Co., Ltd.; L. A. Woodhead, Director (Sales), Cossor Instruments Ltd.; K. C. J. Hutton, Director (Sales), Sterling Cable Co. Ltd.

Marconi's Wireless Telegraph Co. Ltd.

The AFCEA takes pleasure in announcing that Marconi's Wireless Telegraph Co. Ltd. has become a group member. This firm, dealing in radio, radar and electronic manufacturing, is located in Chelmsford, Essex, England, at Marconi House.

Members of the firm who will be company representatives in AFCEA are: F. N. Sutherland, General Manager; B. N. Maclarty, Engineer-in-Chief; R. J. Kemp, Deputy Engineer-in-Chief; Dr. E. Eastwood, Chief of Research; A. W. Cole, Manager, Communications Division; C. L. J. Gillam, Chief Communications Engineer; Dr. B. J. O'Kane, Chief Aeronautical Engineer; J. K. Todd, Chief Radar Engineer; W. J. Morcom, Chief Transmitter Engineer; M. Telford, Assistant to Chief Communications Engineer.

AFCEA Awards

Eighteen officers graduating with top honors at the United States Army Signal School were recently presented the AFCEA Award for outstanding achievement.

BASIC COURSE

Section 713 — Second Lieutenant Robert Geminder, Pittsburgh, Penna., EE, Carnegie Institute of Technology.

Section 714 — Second Lieutenant Edmond B. Collins, West Milford, West Virginia, West Virginia University.

Section 715 — Second Lieutenant Lane W. Gorton, 71 Quincy St., Arlington, Mass., EE, Northeastern University.

Section 716 — Second Lieutenant Malcolm B. Romeiser, Jr., 413 Brampton Dr., DeWitt, New York, EE, Rensselaer Polytechnic Institute.

Section 717 — Second Lieutenant John C. Montgomery, Haskell, Texas, Agricultural Engineering, Texas Agricultural and Mechanical College.

Section 718 — Second Lieutenant Jack H. Bowden, 502 East St., North Talladega, Alabama, ME, Alabama Polytechnic Institute.

Section 719 — Second Lieutenant Joseph P. Wilson, Route 1, Verona, Wisconsin, EE, University of Wisconsin.

Section 720 — Second Lieutenant Jerold P. Gilmore, 147 E. 46th St., Brooklyn, N. Y., EE, New York City College.

Section 721 — Second Lieutenant Louis M. Lund, P. O. Box 33, Gaylord, Oregon, Agriculture, Oregon State College.

Section 722 — Second Lieutenant Herman V. Wood, Rt. 2, Box 32A, Galt, California, attended OCS.

Section 723 — Second Lieutenant Edwin A. Zura, 412 E. 83rd St., New York, EE, New York City College.

Section 724 — Second Lieutenant David L. Grobstein, 222 Main St., Lakewood, New Jersey, Physics, Rutgers University.

Section 725 — Second Lieutenant John F. Tanner, Hulholland Park, Palatka, Florida, IE, Georgia Institute of Technology.

Section 2312 — Second Lieutenant Paul E. Umhoefer, 907 W. 5th St., Marchfield, Wisconsin, English, St. Johns University.

Section 2405 — Second Lieutenant Richard A. Stuber, 1221 N. Main St., Piedmont, Montana, EE, University of Missouri.

Section 3710 — Second Lieutenant Kenneth M. Irish, Jr., 1316 Reycraft Drive, Kalamazoo, Michigan, Physics, Western Michigan University.

Section 4019 — Second Lieutenant Burlye B. Pouncey, Jr., 2342 Tangley Rd., Houston, Texas, EE, Cornell University.

Section 3308 — Second Lieutenant William W. Arrants, 125 S. St. Marks Ave., Chattanooga, Tenn., took top honors in the Wire Communications Officer Course.

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THE REAL STORY OF THE TROJAN HORSE

None of the books will tell you this, but the Tro

Fact is, the Greeks intended to use a radar-contro tists assigned to Project Phony Pony never were abl the Greek commander Odysseus so mad he had all the gates of Troy.

The curious Trojans, neglecting to look this gift h of the war. That night the scientists managed to e

No one could have been more surprised at this the real story and claim all the credit for himself. Wh

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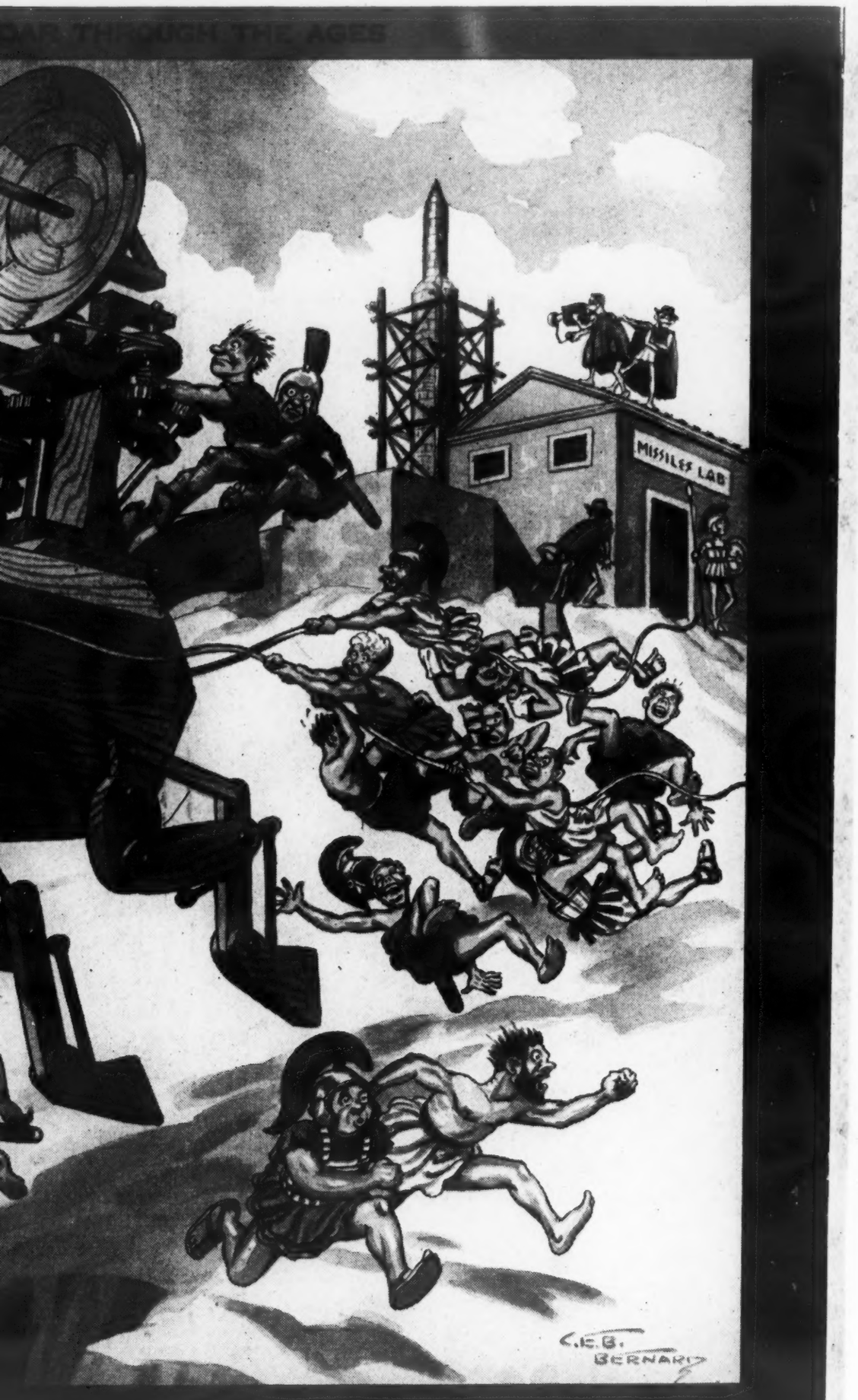
this, but the Trojan War was really brought to an end by radar.

use a radar-controlled horse as a super-weapon against the Trojans. But the scien-
ny never were able to make it work (faulty tubes, someone said) — which made
o mad he had all the scientists sealed up inside the horse and left for dead outside

to look this gift hearse in the mouth, dragged it inside the city — their last mistake
tists managed to escape and open the gates of the sleeping city for the Greek Army.
surprised at this unexpected victory than Odysseus — but he managed to squelch
it for himself. Which goes to show that people haven't changed much in 3500 years.



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